

YOGA RESEARCH FOUNDATION: VOLUME ONE

YRF Journals

1989–1990



Yoga Publications Trust, Munger, Bihar, India

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With kind regards, ॐ and prem

Sriani Niranjan

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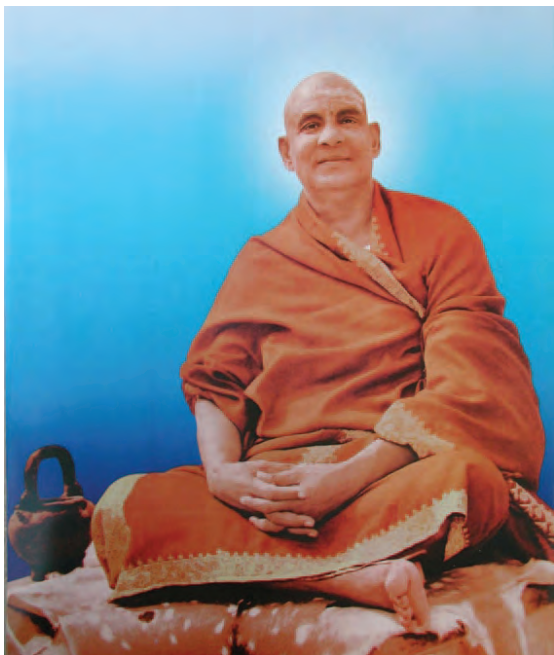
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Dedication

*In humility we offer this dedication to
Swami Sivananda Saraswati, who initiated
Swami Satyananda Saraswati into the secrets of yoga.*

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Preface

Yoga Research Foundation was founded by Swami Satyananda Saraswati in 1984, in Munger. The aim of the institution was to investigate and validate the many aspects of yoga, its techniques, practices and postulates in a scientific manner.

Already in 1977, Sri Swami Satyananda had established the Research Co-ordinating Centre with the same idea and purpose. One of his major contributions in the field of yoga was to introduce yoga to the world of medical and scientific research. Yoga was no longer to be a secret science for sadhus and ascetics, but accessible to one and all. The benefits of yoga are not only a reality experienced by the individual; they can be measured, monitored and analyzed with the most sophisticated scientific equipment available.

Sri Swami Satyananda initiated a worldwide movement of yoga research which carried out projects at hospitals, psychiatric clinics, colleges and universities.

On the occasion of the 14th Foundation Day of Bihar School of Yoga, on 24 January 1977, Swami Satyananda Saraswati addressed a gathering at Sivanandashram in Munger, announcing the creation of the Research Co-ordinating Centre. The following is an excerpt of the address he delivered:

People are coming to Munger from all over the world in order to learn yoga, not only Hindus but people from all religions and walks of life. Today, everyone

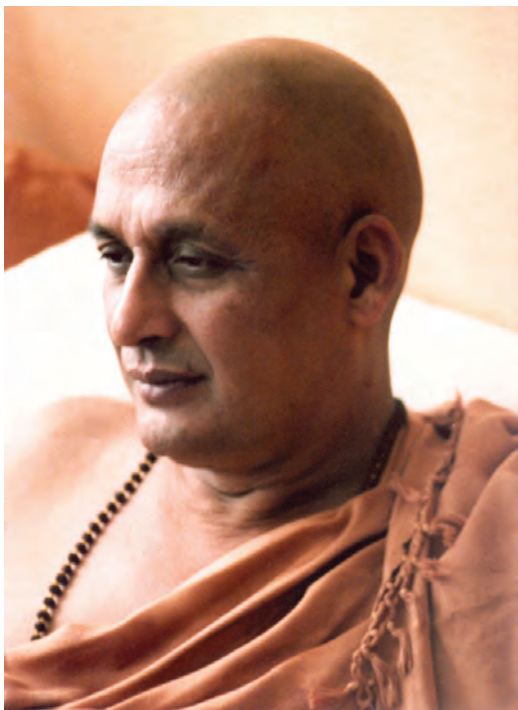
from king to beggar is perplexed, restless, and wants to learn yoga to concentrate the mind, in order to find peace and free their body and mind from disease and tension. This is why our small ashram is transmitting the message of yoga to the whole world.

Many of my sannyasin disciples are doctors, engineers, philosophers and psychologists. Being highly trained, they have a basic understanding of the scientific yogic research going on around the world. Through them whatever research is being done on yoga, East and West, will be brought here, collated and conveyed in a readable form to the people. Our aim is to convey information about the investigations going on in the world. How are alpha waves produced while singing kirtan? How does japa influence blood pressure? What is the effect of relaxation on the mind? What does science have to say about yoga? Over the last five hundred years we have forgotten our yogic culture and spiritual knowledge has nearly disappeared. Today, however, there is a great yogic renaissance going on around the world and spiritual knowledge is again manifesting.

Finally, to all yoga lovers I express the wish that they may share their knowledge and experience with us in the form of assistance and cooperation, so that we can impart this knowledge to the maximum number of people through our new research coordinating centre.

Yoga Research Foundation continues to this day to uphold the vision of Sri Swami Satyananda. Research is carried out at Ganga Darshan, in India, and by centers around the world. The effects of yoga practices are under investigation, as well as the impact of certain yogic practices and yogic lifestyle on physical and mental imbalance. The invitation which Sri Swami Satyananda extended to the scientific and yoga communities remains open, and all are welcome to share their knowledge, understanding and findings of their research into yoga.

MESSAGE FROM SRI SWAMI SATYANANDA TO YOGA RESEARCH FOUNDATION



Yoga Research Foundation was founded in 1984 and now in 1989 the projects and plans which we had envisaged are finally taking a dynamic shape.

I am confident that the Yoga Research Foundation will provide a scientific interpretation of the practices of yoga. Research conducted all over the world has amply indicated this possibility.

Although I am not personally present on this occasion, my thoughts and my spirit are always with the activities of the Foundation, for this is one dream I have cherished.

Swami Satyananda

Introduction

Volume 1 of the Yoga Research Foundation (YRF) publications contains the four journals published in 1989 and 1990. Five years after its foundation in 1984, these journals reflect the energy, enthusiasm and commitment of sannyasins, doctors, medical staff and associates who embraced the new challenge of bringing science and yoga together. With sincerity and careful attention to detail they embarked on this venture.

The first major project was a five-year study on the use of yoga in the treatment of asthma. Yearly doctors' symposiums were held, protocols established, questionnaires created and teams of assistants trained throughout India. It was an enormous undertaking preceded by a one-year pilot project. Simultaneously, an Australian study was carried out. Errors were corrected and procedures fine-tuned. Scrupulous honesty and a deep, uncompromising spirit of enquiry were at the base of this project.

Other studies at that time dealt with the practice of yoga nidra and the enhancement of attention through yoga. A comparison of the effects of smoking, running and yoga practices on total cholesterol were also under investigation.

In his editorial in the second issue of the YRF Journal, Sri Swami Satyananda describes his experiences in the treatment of peptic ulcer, heart disease, diabetes, prolapse of the uterus, cancer and rheumatoid arthritis. This personal

account makes yoga research accessible to readers with little or no medical background.

Regular features in the Journals are *News* and *Correspondence* which allows readers to share their personal experience of yoga in the management of their ailment or illness.

Every Journal reiterates the wish for people to come forward and join the Yoga Research Foundation in its work and mission. The initial invitation of Sri Swami Satyananda to become part of the yoga research movement remains as open and sincere.

For centuries, we have been led to believe that yoga is a path of renunciation, that yoga was meant for people who had renounced life, but now the picture has entirely changed. In order to correct this view I had to travel all over the world, meeting with doctors and scientists. Today they know that yoga holds the master-key for mankind's evolution, for helping him to move out of his present state of limitations and misery.

—*Swami Satyananda Saraswati*

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Survey of the effects of yoga on common disorders

Editorial

In the traditions of yoga and the Upanishads, there are five sheaths of existence in man: annamaya kosha, pranamaya kosha, manomaya kosha, vijnanamaya kosha and anandamaya kosha. The scientific study of the human aura by Prof Tart also delineates the following sheaths of the human aura:

1. The physical aura
2. The psychological aura
3. The psychic aura
4. The projected aura.

The origin of psychosomatic diseases is supposed to be an imbalance in the aura, originating at manomaya kosha level, which gradually percolates to the gross physical frame through pranamaya kosha. When this imbalance is created frequently the disorders finally settle in an organ, depending on the genetic makeup of the individual, showing specific disease symptoms. The tragedy is that modern medicine primarily treats the symptoms and the affected organ only.

Although modern medicine has proved itself most effective in saving man from the fatal hands of infectious diseases, new widespread psychosomatic ailments are posing a great challenge to the modern medical system. The incidence of stress disorders is increasing at an alarming rate throughout the world. At this stage only a system that can give a holistic approach to the problem can give real benefit to sufferers.

In the last few decades much has been added to our scientific knowledge of the science of yoga, which gives insight into the nature of mankind. For scientists who wish to explore the nature of the relationship between body and mind, the work carried out in India and other parts of the world is quite inspiring. These investigations were mainly centred around the following areas: physiological, circulatory and respiratory responses to hatha yoga and meditation, and the effect of hatha yoga and meditation on the endocrine and nervous systems was quite significant.

Studies done aiming to elucidate the physiological responses to hatha yoga show marked improvement in relaxation of the muscles of the buttock and calf. Robson Moss showed significant increase in the flexibility of the hip, trunk and neck muscles of those who practise yoga. Gharote found that positive changes occur in both male and female fitness. Experiments done at Lonavla (Poona) showed that bandhas increase the thoracic volume. While analyzing the effect of hatha yoga on circulatory responses it was found that the cardiovascular efficiency increases. They also recorded that the capacity of an individual to maintain strenuous activity of the whole body has been prolonged by yoga practices. They have clearly shown that yoga practices, which do not involve vigorous exercises, promote cardiovascular efficiency. It was found that asana is quite helpful in alteration of blood flow in different parts of the body. Datey, Patel and Benson observed significant decreases in blood pressure in shavasana and decrease in the level of the drug dependency in hypertension.

Udapa and Gopal assayed protein, urea, creatine sugar and cholesterol contents in relation to hatha yoga practices. Particular attention has been paid to plasma proteins, which include albumins, globulins and fibrinogen. Udapa found a statistically significant decrease of the fasting blood sugar and serum cholesterol after hatha yoga.

Respiratory responses of subjects to hatha yoga were mainly centred around the areas of: nostril dominance, breath holding time, respiratory amplitude, air-movement, tidal volume, minute ventilation, vital capacity and gaseous transfers.

It is now well asserted that the endocrine and nervous systems are toned or stimulated by yoga practices. They are influenced in two ways primarily by local increases in the blood circulation in and about the endocrine glands and nerve plexuses, secondly, by influencing the secretory productions of these glands. Dhanraj, Udapa, and Karambdhar, in their different studies have shown that there were marked changes in the thyroxine, catecholamines, epinephrine, histaminase, plasma cortisol and urinary 17-hydroxysteroids and others while practising yoga.

Gharote, Wenger and Pratap conducted several studies on the effect of yoga on autonomic function and found that there was significant change in the autonomic balance store.

Further studies have clearly shown that the manner in which meditation influences skin resistance and conduction level indicates cortical activity in the brain, and the spontaneous skin conduction indicates the activity of the limbic system. Following meditation there is an improvement in the cortical activity but a decrease in the activity of the limbic system. This might explain how one experiences complete relaxation and tranquillity of the mind after meditation.

When we come to the EEG research in meditation, pioneering work was done by Kasamatsu, Wallace, Brown, Schwartz, Banquet, Hirai and Ananda on the EEG wave form in different types of meditation. However in 1988, one of the karma sannyasis working at Charing Cross Medical School in London was able to map the different brain activity during meditation and yoga nidra in detail, using a computerized 'Brain Imager'. This study has already shown the influence of these practices in bringing about a systematic change in EEG patterns of the brain. They can be displayed on VDU's and stored on floppy discs in the computer. Not only this, he has been able to show how our different moods and thoughts affect the brain wave patterns. This study also explores the possibility of yoga nidra curing different psychosomatic diseases.

Over the last 25 years, Bihar School of Yoga, Munger, has been involved in correlating yoga research and has simultaneously participated in and given guidance on research into the effects of yoga on diabetes and asthma at different places in India. Similar studies have been carried out in Lonavla (Poona), Vivekananda Kendra (Bangalore). In order to see the effect of yoga on cardiovascular problems and on hypertension, it was studied at Patna Medical College, KEM Hospital in Bombay and in London by C. Patel.

Recently very interesting epidemiological works on the effect of yoga was done at Yoga Biomedical Trust, Cambridge, UK. The analysis showed that yoga increased the general

sense of wellbeing and working capacity while decreasing susceptibility to cold. The statistics for days of work on sick leave, consultation with doctors and consumption of medicine showed declining trends. A high percentage of patients suffering from back disorders, asthma, hypertension, duodenal ulcer, haemorrhoids, diseases of the nervous and muscular system, cancer, diabetes, arthritis, pre-menstrual tension, menopausal diseases, obesity, migraine, insomnia, excessive anxiety, smoking habits and alcoholism said yoga had helped them significantly. This is how a growing number of people have begun to give testimony to the emotional and physical benefits of yoga and meditation.

Now it is clear to science that there are meaningful new dimensions of medicines and psychotherapy to be explored. Research work carried out by research laboratories in India and overseas has gradually established the role of the mind and internal awareness in the healing process. To contribute further to this understanding we have established our own research centre at Ganga Darshan through the inspiration of our Guru, Swami Satyananda Saraswati. It remains only for the research workers to take up the modern technological tools of the Research Centre for detailed study of the ancient and timeless techniques which have been designed by the enduring tradition of sages.

Aims, Objects and Methods of the Five-Year Study on the Effects of Yoga on Bronchial Asthma

Swami Omananda Saraswati, BA, LLB (ANU) Fac. Med. (NU)

ABSTRACT: Yoga has evolved from the experiences of great sannyasins over the centuries, whereas the recent advances of medical science have been made through clinical trial. We are now laying the basis for a five-year clinical trial of yoga in relation to bronchial asthma. Past and present medical procedures suffer from the problem of drug side-effects and inability to tackle the disorder's root cause. An integrated yogic approach comprised of asana, pranayama, shatkarmas, relaxation and meditation gives positive results without these problems and also increases patient autonomy. There are considerable difficulties in formulating the procedure of the clinical trial: control subjects must be adequately excluded from yoga; tests show that positive results are limited if physical structural changes have occurred; practices given must be clearly specified and repeatable; follow-up must be systematic; lung function measurement must be standardized and accurate; reduction in medication must be adequately explained.

We witness here the meeting of two powerful contemporary cultures, yoga and medical science. Which of these will have the greater influence on the destiny of the human race is difficult to say now. Yogic wisdom has evolved from the life and philosophy of great sannyasis. In our time, Swami Sivananda of Rishikesh and Swami Satyananda Saraswati have been such persons.

Medical science, on the other hand, advanced comparatively recently by a different method. Since Bradford Hill and the Medical Research Council of Britain first did their investigations on streptomycin in the treatment of tuberculosis and since Doll and Hill published their classic paper, 'A Study

of the Aetiology of Carcinoma of the Lung',¹ the clinical trial has become the accepted means of advancing medical understanding of the management of human disease.

Clinical application of yoga

We are meeting to lay the foundations of a clinical trial of yoga in the management of respiratory disease, bronchial asthma in particular. Those of you who know of the resistance to Harvey's attempts to establish the circulation of the blood or Semmelweis's efforts to make doctors wash their hands, will agree that 'a new idea is the most quickly acting antigen known to science'.² However, 'discoveries made when the time is ripe for them are more readily accepted because they fit into and find support in prevailing concepts, or indeed, grow out of the present body of knowledge'.³

Now the time is ripe for the clinical application of yoga in bronchial asthma. As Tyndall said in his biography of Faraday: 'Before any great scientific principle receives distinct enunciation by individuals, it dwells more or less clearly in the general scientific mind. The intellectual plateau is already high and our discoverers are those who, like the peaks above the plateau, rise above the general level of thought at the time'.⁴

Medical management of asthma

Although it may appear to be so from the recent proliferation of medical literature, asthma is not a 'new' disease. The disorder was described by Hippocrates and the term 'asthma' itself comes from the Greek word 'to pant'. In the 12th century AD, Maimonides, physician to King Saladin, penned a manuscript entitled 'Tractus Contra Passionem Asthmatis' indicating that the psychosomatic approach to this problem has a long history also.

It is in many ways misleading to describe asthma as a single disease. Rather it is a category of syndromes that share the symptom of reversible constriction of the airways but differ in clinical presentation and response to treatment.

However it be described, it is an unquestionable fact that it is the pharmaceutical industry that has made this disorder truly interesting to the medical profession in recent years.

You may recall the previous widespread use of adrenaline with all its systemic effects and stramonium leaf and potassium nitrate cigarettes. In the 1920s even morphine had a role in the treatment of asthmatic attacks.⁵ Now lasting, airway-selective, inhaled beta two adrenergic agonists and methylxanthines (such as theophylline) are the preferred agents in the symptomatic treatment of asthmatics in all stages of severity. Oral and aerosol glucocorticosteroids and disodium cromoglycate are other valuable medications, the latter having some prophylactic action.⁶

There are, however, two great unresolved problems with the present scheme of medical management of asthma. The first is drug side-effects. The inhaled beta two agonists, those medications that mimic the physiological effects of the adrenal medullary hormones and neurotransmitters of the sympathetic nervous system, can produce tremor, mild tachycardia and arrhythmias, especially in patients with pre-existing heart disease. The methylxanthines often cause nervousness, nausea, vomiting, anorexia, hyperactivity and headache. The problems with oral glucocorticosteroids in particular, are well known: cushingoid features, growth retardation in children, glucose intolerance, osteoporosis, weight gain, easy bruising, gastro-intestinal problems, hypertension and hypokalemia (Kaliner *ibid*).

The second and most important difficulty is that all these preparations leave the root cause of the problem untouched. The situation is tolerated because till now the medical profession has not had access to any therapeutic tool that could deal effectively with all aspects of the mental and physical factors that underlie each condition. The great challenge now being thrown out to the medical profession by diseases such as hypertension, diabetes, asthma, arthritis and obesity, is to find a scheme of therapy that integrates all the components of the human personality that is preventive

in nature, is humane, inexpensive and ensures patient autonomy. Yoga is such a system.

Recent studies on asthma

Looking only at asthma, numerous studies have already been published on the effect of yoga or related practices. A 1986 review of the relevant literature found 23 published articles investigating relaxation, biofeedback, systematic desensitization and assertive training with 37 groups of asthmatics.⁷

I feel that the attitude that relaxation alone can help asthmatics is physiologically unsound. By this I mean mostly relaxation after the method of Jacobson. The relaxation response is said to be the parasympathetic alternative to the sympathetic 'fight or flight' response.⁸ But it may be that the parasympathetic nervous system is already overactive and causing broncho-constriction already in asthma in response to stress⁹, so it is unlikely that much long-term relief will be obtained by further stimulation. Of course, relaxation of emotional tension and anxiety provoked by the attack itself is another matter and these comments are not applicable to practices such as yoga nidra.

Predictably few studies of relaxation therapy in bronchial asthma have shown statistical significance and fewer still have shown a clinically significant (greater than 15%) improvement in pulmonary function (Cluss *ibid*). For these reasons also it would be unlikely that brief sessions of relaxing meditation alone make a significant difference to asthmatics. This was borne out by a six-month study at the University of California Meditation School.¹⁰

During this study 21 patients were divided into a group that practised meditation 20–30 minutes twice a day and a group that read about yoga, with crossover at 3 months. Patients and their physicians were asked to rate the usefulness of meditation. Questionnaires at 6 and 12 months and a daily diary provided evidence of the symptom severity, duration and medication. Lung function tests were

performed (PEFR, FEV_1 and Raw) prior to study at the 3-month crossover and at 6 months. The only significant result was a reduction in Raw in 94% of subjects. FEV_1 , and Raw did improve for the first meditation group after meditation but returned to control levels after the 3-month book reading period. For the group that read first, the only significant change was a drop in Raw after they finally did meditation. Some decline in symptom severity scores were noted for both groups over the six months of the trial.

We considered using a crossover design such as this in our trial. A difficulty, however, lies in ensuring 'washout' of the effects of yoga in the group it was given first. These researchers experienced another difficulty; five of the ten patients in the yoga first group admitted to continuing yoga 'at least occasionally' during the control period. The others were not questioned. This emphasizes the difficulty of excluding 'control' subjects too long from yoga if they desire it. The only adequate 'control' group can be one which has had no experience of and has no desire to practise yoga. We do not believe that yoga has yet reached the point of acceptability which makes it unethical to withhold it.

Chronic structural disorders

I now wish to mention two papers which highlight another difficulty with research into the effect of yoga on respiratory disease – the problem of chronic structural disorders in the breathing mechanism.

In a study at the Repatriation General Hospital in Western Australia, 24 men averaging 60 years of age and diagnosed as having chronic bronchitis with or without pulmonary emphysema were divided into two groups. Group 1 performed yogic breathing exercises and ten asanas for nine months with follow-up every month by interview and lung function tests. Group 2 performed physiotherapy relaxation exercises for accessory respiratory muscles, lateral costal, diaphragmatic breathing exercises and general leg and trunk exercises to improve stamina, the follow-up being similar.¹¹

Parameters measured included arterial oxygen tension (Paco 2) arterial carbon dioxide tension (Paco 2), forced expiratory volume in one second (FEV₁) and slow vital capacity (VC). Exercise tolerance was also measured. Significant results were only obtained for the test of exercise tolerance. The author observed a slower and a deeper breathing pattern in the yoga group. A significantly higher number of patients in the yoga group reported a) improved exertion tolerance, b) quicker recovery after exertion, c) control of attacks by yoga rather than medical help, and d) improvement in overall chest condition.

In the other study from the Maulana Azad Medical College, New Delhi, 75 males, averaging 50 years of age and suffering from chronic obstructive airways after a smoking history, were randomly divided into three groups of 25 patients each. Lung function parameters were examined before and after a 12-week period.

Group A received bronchodilators, antibiotics and expectorants as indicated. Group B in addition received physiotherapy: pursed lip-breathing, segmental respiration, diaphragmatic breathing and postural drainage for thirty minutes daily. Group C underwent training in yoga: sithilikarana vyayama, paravritta, trikonasana, vajrasana, shashankasana, paschimottanasana, ardha matsyendrasana, bhujangasana, shalabhasana and also pranayama, for 30 minutes daily.¹²

Group C (yoga) experienced a statistically significant decline in the heart and respiratory rates when compared to group A. Lung function parameters when compared between groups A and B (physiotherapy) and groups B and C (yoga) did not show any statistically significant change.

The inability in these two studies of yoga to improve the lung function of patients with chronic obstructive airways disease is worth noting. If, as appears likely, the effects of yoga on asthma are mediated chiefly through a balancing of autonomic nervous system activity¹³, and release of suppressed emotion¹⁴, then there is little hope for a positive

result where the physical structure has already sustained severe structural changes such as denudation of cilia, chronic inflammatory and eosinophilic infiltration, basement membrane thickening and smooth muscle hypertrophy.¹⁵

Where airflow still only suffers reversible obstruction, we would expect yoga would increase parameters such as PEFR, FEV₁, FEV₃, and FEF₂₅₋₇₅ readily and parameters more likely to represent some structural changes at the periphery of the lung (FVC, VC) with more time in chronic severe airways disease, though improvement in general wellbeing will always be there, it is unrealistic to expect yoga to quickly wipe away the physical manifestations of years of abuse, for example by tobacco smoke.

Integral approach

These studies also raise another important point. It is not a fair trial of yoga on such conditions simply to teach a few asanas and a pranayama or two. Different aspects of integral yoga therapy focus on specific aspects of the somatopsychic balance. Kunjal, neti, kirtan, karma yoga, asanas, pranayama, yoga nidra, each has a particular aspect of the human system to work upon. They should be tried together or not at all. This is not to say that fundamental research shouldn't be carried out on individual techniques, indeed we have just completed our first round of experiments on the bronchodilator effect of kunjal. Clinically, however, only integral yoga can confidently harmonize all the diverse elements in this illness.

Two major studies have been published utilizing an integral yoga regime in the management of bronchial asthma. In 1985 workers from the Vivekananda Kendra Yoga Therapy and Research Centre in Bangalore published a report in the British Medical Journal¹⁶, involving 106 asthmatics divided into two groups.

Group I practised integral yoga: breathing exercises, sithilikarana vyayama and surya namaskara yogasanas, pranayama, meditation and devotional practice using

the mantra *Om*, neti and vaman dhauti, and lectures and discussions on yoga philosophy and therapy, for 65 minutes daily. Group 2 acting as the control, continued on with their usual medication.

Both groups reported at six-monthly intervals for a period of four years and eight months. Patients also kept a daily diary record of each attack of airway obstruction, its severity and the dosage of drugs consumed. PEFR was measured by taking the best of three attempts on a mini Wright peak flow meter.

The authors claimed a statistically significant improvement for yoga as against the control group in respect of number of attacks per week, drug treatment score and peak flow rate. Change in severity of attacks was not statistically significant between the groups. One strange thing about this study is that the control group experienced a marked decline in number and severity of attacks and showed statistically significant increase in peak flow rate also. The increased awareness may have developed through keeping a daily diary; it is certainly an effect we should watch out for.

Problems in the research

Some other criticisms need to be made. The authors failed to explain the massive decline in medication requirements for the control group at 19 and 24 months. The controls were inadequate in having a higher initial drug treatment score. We were not told how many of the subjects were children and thus likely to outgrow their asthma in any event. The yoga group had a higher initial peak flow rate, it being thus plausible that they were in better condition from which to commence improvement.

Over the period of study, 25 patients dropped out of the yoga group, yet 53 patients are still listed in each group in computing those who changed their drug treatment. The yoga practices were poorly described: 'Pranayama (10 minutes) . . . four types of special breathing techniques performed with comfortable, slow, deep breathing.' Is this

really a sufficient description to allow either replication or physiological understanding?

As all the subjects had originally come to the authors' clinic to commence yoga therapy, it would be doubtful whether the control group completely abstained from yoga for 4.5 years.

Details of randomization were not given. The method of taking peak flow readings was not specified. If a reading was taken only at 6-month follow-up, then it is of little value given the extraordinarily labile nature of this parameter. Indeed PEFr results did fluctuate wildly; at 18 months, for instance, the values for the yoga group were well below commencement readings. There was no indication in the data that patients kept daily PEFr readings at home as is generally recommended as a useful means of obtaining a clear picture of the fluctuation in the illness.^{17, 18, 19}

Finally, the insufficiency of PEFr alone as an accurate guide to changes in lung function needs to be commented upon. Some of these criticisms were raised in letters to the Editor of the British Medical Journal.²⁰

A subsequent study

Many of these problems were rectified in a subsequent study by the same authors published in the Journal of Asthma.²¹

In this study 570 bronchial asthmatics were followed. A decline was seen in the number and duration of attacks per week as well as an increase in peak flow rate with the best results being experienced by the regular practitioners of yoga. A decline in medications per week was noted for both regular and irregular practitioners of yoga.

Problems still existed. 408 of the 570 subjects were male. Only peak expiratory flow was used as a measure of lung function. It was not stated how many patients were followed up for 3 and how many for 54 months.

Notable in this study was the well-organized approach to follow-up which included yearly follow-up camps of 1–3 weeks, a newsletter, reminder letters and assigned visits to outpatient clinics as well as home visits.

In conclusion

We have just completed statistical analysis of the data from our investigations of pre-and post-lung function readings from six asthmatics who attended a Health Management course here from 15th–29th December 1988. Improvement in FVC, FEV₅, FEV₁, FEV₃, FEF_{25–75} and PEF were statistically significant while values for VC, FVC, FEV₁ as %FVC were not. This again emphasizes the point about the tone of the airways responding to yoga while structural changes at the lung periphery do not.

There are many exciting challenges and prospects awaiting us in this five-year trial. We may find that ida nadi, passive, mental energy is predominant in asthmatics with left nostril flow being the obvious external sign.

Other hypotheses such as those proposed by Swami Sivananda in his work 'Karmas and Diseases' will be more difficult to probe. I refer to the origin of asthma in past karma such as, he writes, 'oppression of workers, suffocating of fishes, blocking up the holes of animals' (Sri Swami Sivanananda, *Karmas and Diseases*, Divine Life Society, Rishikesh 1962).

It seems that just as Christianity became universalized through incorporation into the pre-existing widespread culture of the Roman Empire, so in our time we will see yoga become an entrenched part of the international culture of medical science. Some astounding discovery will be made, some terrible disease removed from the list of threats to mankind. Then, with attention focused upon it, yoga will reveal to mankind the purpose of its existence.

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Preliminary Study of Effects of Integral Yoga on Bronchial Asthma

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ABSTRACT: *As a preliminary study for a planned five-year trial of the effect of Integral Yoga on respiratory disease, 6 bronchial asthmatics underwent lung-function tests on an Autospiro AS600 spirometer before and after a fifteen-day Integral Yoga Health Management Course. Analysis of result using Student's 't' test showed statistically significant improvement in: FEV_{0.5} ($p < 0.01$); FEV₁ ($p < 0.02$); FEV₃ ($p < 0.01$) FEF₂₅₋₇₅ ($p < 0.05$) and PEF ($p < 0.05$). Values for VC ($p > 0.05$), MVV ($p > 0.05$) and FEV₁/FVC% ($p > 0.5$) were not significant. Despite advice to the contrary, at the conclusion of the course considerable reduction in medication was noted in all subjects.*

All subjects reported subjective improvement in lung function. The results indicate that this short course in Integral Yoga is able to significantly improve large and small airway function in moderately severe asthmatics. Long-term structural changes affecting lung capacity may not have been influenced in this brief period. Whether these benefits can be sustained on follow-up with larger numbers of patients having matched controls will be the subject of the following five-year investigation.

KEYWORDS: *yoga/asthma/lung function*

Previous studies have indicated that yoga derived practices (relaxation therapy and meditation) and Integral Yoga in particular, are beneficial in the management of bronchial asthma.¹ The rationale for this benefit is said to lie in the ability of yoga to: balance activity in the autonomic nervous system; improve pulmonary compliance through correcting posture; improve respiratory muscle strength and remove

excess mucus; reduce anxiety and restore self-confidence.² Further research is required, however, in this controversial area, both to replicate previous studies and to do so within the context of a well-designed, controlled trial using accurate instrumentation.

As preliminary work for a planned five-year study of the effect of Integral Yoga on respiratory disease, we wished to investigate what benefit immediately accrued to previously untrained subjects after a short course in Integral Yoga Therapy. We also wished to use this pilot investigation to train technicians and standardize teaching and testing procedures.

Methods

The six subjects reported, all over 33 years, had approached the ashram to take part in its general Health Management Course held at Ganga Darshan, Munger, from 15th to 29th December 1988. Three other asthmatics also taking part were not selected as two were complicated by high blood pressure and one was not able to practise all the techniques taught.

Informed consent was obtained from all subjects.

Before commencing the course all subjects underwent full lung function testing on an Autospiro AS600 computerized spirometer Minato Medical Science Co. Ltd. 13-11 Shinkitano 3-Chome, Yodogawa-ku, Osaka, Japan. This is a computerized 'hot-wire' spirometer that records data from three tests: Forced Vital Capacity (FVC), Maximum Voluntary Ventilation (MVV) and Vital Capacity (VC).

Tests were performed according to the guidelines established by the American Thoracic Society 'Standardization of Spirometry – 1987 Update'.³ Results are recorded in Table 1.

Details for the six subjects are set out in Table 2.

The fifteen-day course consisted of a morning group session learning and practising asanas (yogic physical poses and exercises), from 6.00 am to 7.30 am; a session from 8.30 am to 9.30 am which concentrated on pranayama (yogic breathing exercises) and an afternoon session from

2.00 pm to 3.00 pm in which yoga nidra relaxation was taught. During the course, subjects were also instructed in the techniques of voluntary saline nasal wash (jala neti), stomach wash (kunjai), full gastro-intestinal wash (shankhaprakshalana) and vastra dhauti (swallowing a long piece of cloth into the stomach and removing it). These cleansing practices were not performed each day. A full description of the practices may be found in the book *Asana Pranayama Mudra Bandha* published by the Bihar School of Yoga.⁴ The asanas and pranayamas performed in this study and the ones to be performed in later studies will be published later on in a separate article.

Ashram meals were served at 7.30 am, 10 am and 5 pm. consisting of light vegetarian food. Tea was served at 1.30 pm. Kirtan, mantras to the accompaniment of drums and harmonium, took place each night at 6.00 pm. Subjects attended satsang, between 3.00 and 4.00 pm. Light karma yoga involved learning to work without anxiety about the results in either cleaning or gardening.

Full spirometric tests were repeated either on the penultimate or final day of the course. At this time subjects were also asked to complete a brief questionnaire which included a question on the change in their subjective assessment of their respiratory problem and an examination of their asthma medication consumption over the period of the course.

Results

Results are set out in Table 1. Values $FEV_{5'}$, $FEV_{1'}$, $FEV_{3'}$, FEF_{25-75} and PEF were statistically significant when analyzed according to Student's 't' test, (deemed appropriate because the number of subjects was small and we were dealing with a paired comparison.⁵ Values for VC, MVV, FVC and $FEV_1/FVC\%$ were not statistically significant.

Average percentage improvement from pre- to post-course reached or exceeded clinical significance (15%) for all parameters except FVC.

Subject 1 stopped medication completely during the course and experienced no attacks.

Subject 2 ceased medication also but experienced one attack which was controlled without assistance by use of the yogic practices laghoo shankhaprakshalana and pranamasana.

Subject 3 stopped medication and had one mild attack that subsided without assistance.

Subject 4 halted medication after the fourth day and experienced no attacks.

Subject 5 had already been managing her condition by yoga with medication for four years. She experienced no attacks during the course.

Subject 6 substantially reduced medication from cortasmyl (3 tabs/day) betnesol (1 tab) to cortasmyl (1 tab) and no betnesol. She had two attacks, one after the group practice of shankhaprakshalana and one after a period of rain. Both were easily controlled by medication (asthalin inhaler and 1 tab).

When asked at the conclusion of the course: “Which best describes your respiratory problem after the course: a) worse, b) improved, c) not changed?” All subjects replied ‘b) improved’.

Discussion

The subjects were seasonal asthmatics and four of them were attending the course during their worst period (winter October–December). There was no history to suggest that improvement in lung function would come by removal to the ashram site, its elevated location and proximity to the river Ganges ensuring a relatively clean atmosphere. The only exception to this may have been Subject 5 who came from the coalfields district of Giridih.

Most subjects were accustomed to taking a hot bath at home and lung parameters could have been adversely affected by daily cold water baths in the ashram.

Large deviations from the mean may explain why results for many parameters failed to reach statistical

significance despite having an impressive average percentage improvement in lung function over the course. It may also be that whilst yoga was able to relieve the mental and emotional tensions underlying the disease with consequent reduction in parasympathetic mediated bronchial smooth muscle constriction⁶, long-term postural changes, respiratory muscle debilitation and possibly fibrotic or other changes due to undisclosed prior infection, require a more lengthy period of training to be modified. This might explain why measures of large and small airway flow (FEV₅, FEV₁, FEV₃, PEF and FEF₂₅₋₇₅) showed significant improvement while measures more representative of pulmonary compliance and resistance in the periphery of the lung i.e. (VC, MVV, FVC and FEV₁/FVC%) did not.

Given the above, the reduction in medication and subjective improvement in wellbeing, this study provides good evidence that even such a short course of Integral Yoga Therapy can significantly improve the lung function of asthmatics. In yoga the Indian medical profession may well have a powerful adjunct to medication with possible worldwide application. Whether such claims are justified by controlled trials with larger numbers of subjects and longer follow-up will be the subject of investigation in our following five-year trial.

TABLE 1
Lung Function Parameters before and after Integral Yoga.

SD	= Standard Deviation
SE	= Standard Error
FVC	= Forced Vital Capacity
MVV	= Maximum Voluntary Ventilation
VC	= Vital Capacity
MVV	= (L/M) Maximum Voluntary Ventilation (liter per minute)
FVC	= (L/M) Forced Vital Capacity
FEV	= Forced Expiratory Volume
FEF	= Forced Expiratory Flow
PEF	= Peak Expiratory Flow

TABLE 1

Subject No.	VC		(L)		MVV		(L/M)		FVC		(L/M)		FEV _{0.5}		FEV ₁		FEV ₃		FEF ₂₅₋₇₅		PEF		FEV ₁ /FVC%	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Subject 1:	1.53	2.45	56.2	53.2	1.69	2.25	0.91	1.19	1.26	1.62	1.69	2.24	0.96	1.16	2.99	4.42	74.5	72						
Subject 2:	0.53	1.90	38.8	63.4	1.74	1.87	1.35	1.60	1.68	1.87	1.74	1.87	2.47	3.23	3.59	6.10	96.5	100						
Subject 3:	4.91	3.74	51.3	75.8	3.29	3.45	1.54	1.66	2.39	2.55	3.29	3.45	1.94	2.08	5.05	5.89	72.6	73.9						
Subject 4:	1.51	1.41	48.9	46.7	2.35	2.42	1.10	1.20	1.59	1.74	2.17	2.35	1.05	1.27	4.86	4.68	67.6	71.9						
Subject 5:	0.59	1.64	39.3	41.2	1.03	1.23	0.5	0.9	0.57	1.21	0.79	1.23	0.18	1.47	2.07	2.85	55.3	98.3						
Subject 6:	0.49	1.74	23.5	26.4	1.55	1.14	0.36	0.49	0.54	0.76	0.91	1.13	0.76	0.52	0.89	1.98	34.8	66.6						
P	>0.05		>0.05		>0.05		>0.01		>0.02		>0.01		>0.05		>0.05		>0.05							
SD	0.993		12.9		0.3115		0.1176		0.1891		0.1726		0.455		0.8761		16.7							
SE	0.4		5.27		0.1272		0.048		0.0772		0.0704		0.185		0.3577		6.8							
% Improvement	34.73		18.88		6.07		22.22		21.42		15.57		28.13		33.26		20.2							

TABLE 2

Subject No.	History
Subject 1: <i>Sex: Male</i> <i>Age: 67</i>	Constant wheeze, breathlessness on exertion and morning cough started 1968. Diagnosed as bronchial asthma 1971. Worse in winter (Oct–Dec). Takes asthalin inhaler during an attack, otherwise ayurvedic medicine.
Subject 2: <i>Sex: Female</i> <i>Age: 33</i>	Incapacitating breathlessness, lasting two days at a time during the worst period (change of season Sep and Mar), chest pain and chest tightness, since 1980. Diagnosed as bronchial asthma 1980. Homeopathic medicine taken.
Subject 3: <i>Sex: Male</i> <i>Age: 38</i>	Incapacitating breathlessness, weekly, worse in evening and at change of season (Sep and Mar), since 1980. Diagnosed as bronchial asthma 1980, homeopathic medicine taken.
Subject 4: <i>Sex: Male</i> <i>Age: 36</i>	Morning wheeze and cough and attacks of breathlessness (10 min) every 10 days during winter (Oct–Dec), since 1986. Takes theoasthalin (1/2 tab) and terbutaline (2.5 mg) morning and evening.
Subject 5: <i>Sex: Female</i> <i>Age: 36</i>	Morning wheeze and cough and attacks of breathlessness during worst period (winter Oct–Dec) since 1979. Diagnosed as bronchial asthma 1983. Takes prednisolone (1 tab) during severe attack, otherwise yoga practice.
Subject 6: <i>Sex: Female</i> <i>Age: 37</i>	Constant wheeze and cough and incapacitating breathlessness during worst period (winter Oct–Dec) since 1973. Diagnosed as bronchial asthma 1975. Has been admitted to hospital 4–5 times. Takes asthalin inhaler, cortasmyl (1–3 tabs) and deriphyllin (2–3 tabs) during attack and asthalin inhaler and deriphyllin (1 tab) and betnesol (1 tab) normally.

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Brain Electrical Activity Mapping During Yoga Nidra

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ABSTRACT: *Experienced yogis and inexperienced controls practised yoga nidra whilst their brain wave activity was recorded on a computerized Brain Imager at Charing Cross Medical School. A third group was recorded whilst performing a control practice for the same period. The yoga nidra subjects experienced a large average increase in alpha activity during phase 1 (rotation of consciousness) which fell away to be replaced by synchronized theta and delta activity in phase 2 (visualization). Subsequent checking revealed total recall of instructions only amongst the experienced yogis. The control group exhibited scattered asymmetrical activity throughout. Yoga nidra thus appears able to produce a state characteristic of deep sleep but with sustained awareness in regular practitioners.*

KEYWORDS: *yoga/EEG/brain/relaxation*

Yoga nidra is a yogic practice developed by Swami Satyananda Saraswati and promoted by the Bihar School of Yoga. It is a systematic method of inducing complete mental, emotional and physical relaxation. Yoga nidra is usually performed in the yoga pose *shavasana* (supine with the arms to the sides and palms upwards, in its therapeutic role in institutional settings. However it is often performed with the subject seated.

The first characteristic feature of yoga nidra is the systematic rotation of awareness through the different parts of the body. This originated from the tantric practice of *nyasa*. In *nyasa* a seated yogi would, in ritual fashion, place or feel specific *mantras*, sound vibrations, at different parts of the body.

The second feature of the practice is a period of visualization, usually of symbols or scenes selected by the yoga teacher from a standard series set out in the book *Yoga Nidra*, published by the Bihar School of Yoga.¹ Instructions

are normally given throughout by a yoga teacher or a tape recording. With experience the subject can give the instruction to himself or herself.

During the normal sequential pattern of descent from wakefulness to deep sleep the brain wave frequency changes from fast frequency beta waves with above 14 cycles per second, to theta (4–7 cycles per second) and lastly to delta (0–4 cycles per second).

The difference between normal untrained sleep and yoga nidra is claimed to be that in yoga nidra an intermediate platform of alpha wave predominance (7–14 cycles per second) associated with relaxation, is created between the beta wave patterns of the wakeful state and the slow delta rhythm of deep sleep. The result of this is said to be complete relaxation of mental, emotional and muscular tensions.²

It was our intention to verify whether these changes did take place. If they did then a corresponding alteration of EEG should be detected.

Methods

The study took place in January 1988 at Charing Cross Medical School in London.

34 female subjects, all right-handed, were assigned into three groups:

Group 1 consisted of experienced yoga practitioners selected from a pool of volunteers associated with Swami Dayamurti and Swami Pragyamurti of the London branch of the Bihar School of Yoga.

Mean age of the 13 subjects in this group was 37.2 years (range 35–43 years). Mean length of yoga practice was 8.3 years (range 4–15 years).

Group 2 subjects consisted of Charing Cross medical students with no previous experience in meditation or yoga. They were randomly selected and had a mean age of 22 years (range 20–25 years).

Group 3 was a 'control' group of medical students drawn from the same pool as Group 2.

The difference in mean age between Group 1 and Groups 2 and 3 was unavoidable owing to the difficulty in obtaining, i) younger, experienced yoga practitioners, and ii) an older control group of inexperienced subjects.

One Subject dropped out of Group 1 and one from 2 owing to improper electrode placement and equipment failure causing incomplete data.

Informed consent was obtained from all subjects prior to the experimental session.

All subjects were studied while seated in a sound attenuated, light controlled neurophysiological chamber (Faraday cage). Data was taken by means of a Brain Electrical Activity Mapping (BEAM) instrument (Neuroscience Pvt. Ltd., USA). This transforms brain electrical activity from the three dimensional curved surfaces of the scalp and cortex to two dimensional colour image on a visual display unit with an outline of the head in the centre. Input was derived from 26 monopolar electrode sites, using a modified 10.20 electrode system recommended by the International Federation of EEG Societies.

The pierced, stannous chloride, cup-shaped electrodes were placed inside a nylon mesh cap and contacted the skin through a cushion of electrolyte gel. The electrodes convert ionic potentials generated by nervous tissue into measurable electric potentials. Electrolyte gel was injected through the electrode cup hole via a blunt 100ml syringe, and had the effect of both reducing the impedance between the skin and the electrodes and firmly sticking the electrodes to the skin.

The distance from the nasion to the inion was measured and the frontal polar electrodes positioned 10% of that distance above the nasion. The occipital electrodes were placed the same distance above the inion. Reference electrodes were attached to each earlobe, connecting the subject to the common earth of the BEAM machine. Single values were obtained for each of the electrodes representing the amount of energy in a given EEG frequency band. The

outline, electrode coordinates and the interpolation weight were stored together in a computer file for map generation.

The visual display unit can present a 'map' in four manners: a left and right hemisphere only, a left minus right hemisphere difference, and dual hemispheres. The dual presentation is a top-down (superior-inferior) view with the subject's nose at the top of the screen. The specific frequency band and voltage colour scale is presented at the right edge of the screen. The number of frames since the beginning of any operation is also shown with the equivalent time span alongside it (frame) 1=2.5 seconds. In this way the topographic distribution of spectral energy in any classic EEG frequency band can be viewed at any 2.5 second epoch. The numerical matrices underlying the images are stored for later statistical analysis. At the commencement of each session subjects were asked to sit quietly for five minutes with their eyes open whilst basal data was recorded on a 3.5" floppy disc.

Subjects were asked to gaze at a target and suppress their eye blinking until one minute of artifact-free recording was established. Verbal communication ceased and lighting was dimmed. Group 1 (experienced yogis) and Group 2 (inexperienced) then listened to a tape recording (Sony T25350 portable tape player) of a yoga nidra practice with the eyes closed. The practice had four parts: progressive awareness of the parts of the right side of the body from fingers, through arm, leg to toes; awareness of the left side (100 seconds duration each); awareness of the face, chest, back, abdomen and thighs (155 seconds duration); and finally, a visualization process which included images of a walk through the mountains, on a beach, and returning to home (255 seconds duration).

Group 3 listened to a 'control' tape by the same speaker, in the same tone and rate of speech. The subject matter concerned the physiology of meditation. After listening to the tapes, subjects were again asked to sit quietly whilst basal data was recorded.

Subjects who had listened to the yoga nidra tape were questioned as to the nature of the visualizations. This was designed to determine whether the subjects had fallen asleep.

Results

In this study both the experienced and inexperienced groups listen to a yoga nidra tape, and relax and concentrate on the instructions. While practising yoga nidra both Group 1 and Group 2 subjects show average increased alpha activity in the eyes closed state. This was more pronounced in the right occipital areas of the brain. At the beginning of the rotation of consciousness there was higher bilateral occipital alpha activity.

The moment the subject entered the visualization state there was a clearly marked asymmetrical distribution of alpha over the occipital region; further there was an asymmetry indicating higher activity over the right hemisphere. Delta slowly appeared in the right hemisphere of the brain and this gradually became more conspicuous in both hemispheres, representing a very calm state by the end of the visualization and yoga nidra.

The appearance of alpha blocking for both groups of the subjects during rotation of consciousness suggests that there was an increased alertness.

In visualization, delta activity and the emergence of a characteristic pattern of slow-rhythm delta waves shows the mind has gone into the state of deep sleep. However, most of the subjects in Group 2 remained perfectly aware throughout the entire experimental period. The study also reveals the fact that yoga nidra brings simultaneous activation and relaxation in both hemispheres of the brain, which under normal circumstances seldom operate at the same time.

By the end of the visualization a complete, synchronized, very slow, low activity of the brain, which is marked by the appearance of blue colouring in both hemispheres was clearly recorded. This suggests that yoga nidra is a 'sleepless

sleep' because we learn to enter the state between sleep and wakefulness without loss of awareness.

Conclusion

This research supports the claims that, in a short time, yoga nidra is able to induce a state of deep relaxation which is characterized by awareness rather than unconsciousness, as in sleep. The two hemispheres of the brain rarely operate together and the ability of yoga nidra to generate synchronized and symmetrical alpha and delta waves indicates its probable beneficial application in a large variety of psychosomatic problems.

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Yoga Research Foundation Yoga-Asthma Study Research Protocol

Introduction

Over the last twenty-five years, Bihar School of Yoga, Munger, has been involved in correlating yoga research conducted in India and other parts of the world. It has also simultaneously participated in and given guidance on research into the effects of yoga on diabetes, aided by ashrams in Calcutta (West Bengal), Sambalpur (Orissa) and the Burla Medical College, Orissa. The effect of yoga on asthma has been studied by our ashram in Raipur in collaboration with the Raipur Medical College, the Begusarai ashram and the IMA Chapter of Begusarai. Similar studies have also been made on the effects of yoga on cardiovascular problems and its effects on hypertension by the Patna Medical College and Dr K.K. Datey at K.E.M. Hospital, Bombay.

To consolidate this work, the Bihar School of Yoga has developed its own research centre in a seven-storey complex at Ganga Darshan ashram. These facilities are designed to assist the conduct of systematic and properly documented research in collaboration with health professionals who are interested in furthering their knowledge of how yoga can correct and improve malfunctions in the human body and mind.

The Yoga Research Foundation centre is now completed and to commemorate the Silver Jubilee of Bihar School of Yoga, an extensive five-year research program into the *Effects of Yoga on Respiratory Ailments* was inaugurated in Munger on Basant Panchami in 1989. This research will be a joint project with the Yoga Therapy Research and Education Centres in Australia.

In the past, a number of reports have been published in international journals stating that yoga and/or related practices (such as relaxation and meditational therapies) are

beneficial for the management of asthma.¹ However, this remains a provocative area of research as very few long-term prospective studies on the effects of yoga in the management of asthma have as yet been undertaken.

One published study conducted for between 3–54 months in Bangalore by the Vivekananda Kendra Yoga Therapy and Research Centre, which involved 570 asthma patients, showed considerable reduction in frequency, duration and severity of attacks. Reductions in medication and increases in PFR (Peak Flow Rates) were recorded.² There are also other studies which have shown similar positive changes in the respiratory function of asthmatic patients due to yoga.³

However, it is now necessary not only to replicate, but to take these researches further, utilizing more accurate instruments and observing more parameters.

Further evidence of the long-term effects of yoga on asthma is particularly important in view of the increasing mortality and morbidity from this disease in recent times, despite improved medication⁴, and to investigate numerous claims that yoga is able to effectively improve asthmatic conditions.

Accordingly, in this study we will utilize:

- a) more sensitive measures of lung function than PFR alone;
- b) more comprehensive respiratory measuring equipment than the peak flow meter alone (Minato AS 600 Spirometer);
- c) a population drawn from India as a whole rather than just one city or locality;
- d) more detailed questionnaires.

The Yoga Research Foundation will be conducting this research study for five years, with a pilot study of one year. Yogic management will be provided as per the training given at the Bihar School of Yoga, following the Integral Yoga System of Swami Satyananda Saraswati.

Our central hypothesis is that yoga can improve:

- 1. asthma symptoms
- 2. asthma control

3. lung function in asthmatics
4. asthma severity
5. asthmatic psychological state.

DETAILS OF THE STUDY

1. Selection of subjects

Asthmatics who satisfy the following criteria will be recruited. Those who show:

- a) proven asthma with demonstrated airways obstruction (FEV_1 80% predicted) and at least 15% reversibility after bronchodilator or symptoms consistent with asthma and a positive histamine challenge. (It is unlikely however, that we will proceed with histamine challenge, at least for the pilot study. The lack of education in our subject population could, we were advised, lead to severe misunderstandings from such a method. Also access to adequate back-up facilities is restricted in India.)
- b) a significant level of asthmatic symptoms, with nocturnal asthma at least two nights per week or wheeze most days when on maximal therapy.
- c) no complicating disease, as determined by a physician, which is likely to cause significant health dangers to themselves or other subjects. i.e. cardiac failure (ECG) and TB (ESR/CXR).

2. Informed consent

Each subject will give informed consent (a consent form is part of the initial questionnaire). Where necessary the information sheet and following consent form will be translated into Hindi.

3. Design

Large numbers of asthmatics already regularly attend the health management courses run throughout the year at Ganga Darshan ashram. These people will be asked to participate in the study. Subjects will also be recruited at the initiative of karma sannyasins associated with the

ashram, Yoga Mitra Mandals (YMM's) and Regional Health Coordinators appointed by the Yoga Research Foundation.

Prospective subjects will forward applications to participate in the study to:

The Yoga Research Foundation
Ganga Darshan, Fort
Munger, Bihar 811 201

Invitations will be sent for them to attend a period of examination, both spirometric and medical, held either at Ganga Darshan ashram or at a regional 'camp' organized in advance specifically for the purpose.

If entry criteria are met, subjects will be allocated either to a control group which will continue on their usual medication or to a group that will receive instruction in yoga. The yoga instruction will either be as part of the regular health course program of the ashram or involve attendance at special 'asthma camps' to be held at Ganga Darshan.

Both groups will be asked to keep daily charts of their progress and to visit their Regional Health Coordinator each month for an examination. Attendants from the ashram will also visit those areas from which substantial numbers of patients have been drawn, for testing at approximately six-monthly intervals. All subjects will be encouraged to return to the ashram for examination and further instruction in yoga if applicable, but it is envisaged that this may not be possible in all cases and on a regular basis.

It is estimated that several thousand subjects will be involved over the period of the study.

Participating health professionals who become Regional Health Coordinators will have the duties of:

- a) monthly examination of subjects, involving the checking of daily charts, the completion of a Physician's Evaluation Questionnaire and forwarding these to the ashram.
- b) encouraging subjects to continue record keeping and yoga practice, if applicable, and assisting karma sannyasins and YMM's to organize local activities which will help achieve this aim.

Medical practitioners associated with the study will also be invited to supervise one of the fifteen-day asthma courses held at the ashram; therein to administer questionnaires, perform medical examinations and supervise any health requirements that arise.

4. Data management and analysis

Data will be collected by the use of:

1. *An Initial Questionnaire* detailing the type and severity of respiratory disorders. It will include the validated method of scoring respiratory symptoms developed by Gulsvik and Refvem.⁵ The validated 15-point MMPI Panic-Fear Scale developed by Dirks et al⁶, was found unsuitable for the Indian population and as a result a separate new series of seven psychological state questions has been developed specifically for the trial by the long-associated Czechoslovakian psychiatrist, Dr Karel Nespor.

These questions will assess the psychological changes, if any, resulting from the yoga therapy. Seven variables which are generally considered to be important in psychosomatic patients have been chosen.

1. Depression – cheerfulness
2. Anxiety – security
3. Helplessness – control
4. Despair – hope
5. Alexithymia – ability to express emotions
6. Alienation – meaningfulness
7. Family – relations.

As with any subjective quiz of mental state, the possibility of the subject's misunderstanding and/or manipulation cannot be excluded. However, to increase the validity of the quiz, a slightly modified version, inquiring into the patient's psychological state has been included in the monthly Physician's Evaluation Questionnaire.

2. *A Physical Examination Questionnaire* will be completed by a medical practitioner upon the subject's enrolment in the study.

3. *A Physician's Evaluation Questionnaire* will be administered monthly, checking on the progress of symptoms, compliance with the yoga regime and evaluating any psycho-social changes.
4. *Daily Record Charts* which subjects will be asked to complete, will provide details of asthmatic symptoms, yoga practices and peak flow rates. In the pilot year we will examine the feasibility of supplying patients with peak flow meters for home use.
5. *A Follow-up Questionnaire* to be given either at the ashram or at the periodic regional follow-up camps.
6. *Initial and Follow-up Spirometric Data* from a Minato AS 600 Spirometer. Each test will involve morning and afternoon readings pre- and post-bronchodilator. Predicted values will be prepared according to the norms for an Indian population as reported by Kamat.⁷ Tests will be performed according to the American Thoracic Society (ATS) 1987 Standardization of Spirometry.⁸

All relevant data will be entered onto an IBM XT computer, with a 20 M byte mass storage capacity. The parameters to be investigated from this raw data will be:

1. Number of episodes per week
2. Duration of episodes
3. Nature and severity of symptoms
4. Medication requirements
5. Psychological profile
6. Lung function: VC; MVV; FVC; $FEV_{0.5}$; $FEV_{0.5}/FVC\%$; FEV_1 ; $FEV_1/FEC\%$; FEV_3 ; $FEV_3/FVC\%$; FEF_{25-75} ; PEF; FEF_{25} ; FEF_{50} ; FEF_{75} .

For the pilot study, the changes in these parameters over the initial six months of yogic treatment will be tested for proper statistical significance.

Since the number of patients involved in this study is likely to be large and from all parts of India and abroad, this may also afford us the opportunity to produce some interesting demographic statistics. For example: precipitating factors in relation to area and age, severity of asthma in relation to diet, etc.

5. Yoga practices

The principles of yogic management of asthma have been outlined by Dr Swami Shankardevananda Saraswati⁹ and Goyech.¹⁰ Basically, these involve:

- a) Increasing vitality
- b) Improvement of physiological and psychological conditions through yogic asanas, pranayamas and philosophy
- c) Reduction of anxiety and lack of confidence
- d) Reduction of respiratory mucus through dietary manipulation and nasal and gastric lavage
- e) Correction of postures which disadvantage respiratory muscles.
- f) Relaxation and strengthening of breathing muscles
- g) Encouraging emotional release.

The practices themselves comprise five different programs:

- a) Child Asthmatics under 16 years
- b) Adult Asthmatics, 16–55 years
- c) Elderly Asthmatics over 55 years
- d) Asthmatics with high blood pressure
- e) Asthmatics with arthritis.

6. Care of subjects

The subjects' asthma will be treated by their usual medical attendants. No alterations of medications will be made by the researchers. Medical practitioners will be in attendance whilst the subjects are examined and instructed in yoga. Subjects whose results suggest that their asthma is poorly controlled will be referred to their usual attendants.

7. Feasibility

The study is feasible owing to:

1. The experience of the Bihar School of Yoga and its yoga teachers in teaching large numbers of people with respiratory complaints, of which the Yoga Research Foundation will avail itself.
2. The availability of medical staff both at the Yoga Research Foundation and as Regional Health Coordinators.

3. Possession of up-to-date computer and portable respiratory measuring facilities.
4. Access to the necessary residential facilities by the Yoga Research Foundation.
5. Access to comprehensive library facilities, including previously published reports and articles related to the proposed study.
6. The availability of assistants from affiliated institutions and ashrams around the world.
7. Access to advice from interested health professionals and computer data analysts.
8. The established reputation of the Bihar School of Yoga as a major yogic training and therapy centre in India.
9. The high prevalence of the disease in India and in areas accessible to the Bihar School of Yoga and its branch ashrams.

8. The Bihar School of Yoga and the Yoga Research Foundation

The Bihar School of Yoga (BSY) was established in 1964 by Swami Satyananda Saraswati as a residential centre for systematic yoga training. In the course of time, due to the reputation of BSY as an ashram-cum-healing centre, patients started to arrive from all parts of India and abroad for relief from their ailments.

In order to meet the growing demand for a structured and scientific system of yoga which can be accepted by the scientific and medical world community, Swami Satyananda established the Yoga Research Foundation (YRF) 20 years later, in 1984.

The YRF is thus designed to validate yoga as an integrated and natural way of re-balancing the body to eliminate physical and psychological suffering. The newly constructed research centre at Ganga Darshan has been handed over by BSY to the YRF to further its aims and objectives.

The YRF aims to conduct various research projects and to train health professionals and other interested persons in the correct use of yoga therapy.

Before establishing its own network of Therapy, Research and Education Centres, YRF will rely on the expertise and experience of BSY, its teachers and affiliated centres.

This research study on the *Effects of Yoga on Respiratory Ailments* is the first project of the YRF, which we hope will become a catalyst to encourage similar projects by other institutes around the world.

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Report on the Doctors' Symposium

To contribute further towards understanding the role of yoga in the healing process, Swami Satyananda Saraswati has established the *Yoga Research Foundation*, a research centre in the seven-storey building at Ganga Darshan.

As the first project of YRF, an extensive five-year research program to analyze the effects of yoga on asthma has been started, in collaboration with the yoga therapy research and education centres in Australia. The project was inaugurated at Ganga Darshan, Munger on Basant Panchami on 10th February 1989, in the presence of delegates from all over India and visiting health professionals from Australia. The meeting was well attended by more than fifty medical practitioners and health professionals of conventional and complementary medicines and was presided over by Swami Niranjanananda Saraswati, Chief Patron of YRF.

The attending delegates constituted a general body and panel. In an open meeting they discussed protocol for the asthma study and adopted it for the future research program.

Interesting research papers were presented by participants. A very informative video on 'Asthma', prepared by the Yoga Research Foundation, Munger, was displayed to the participants. It gave details about the pathogenesis of asthma and the influence of yogic methods in alleviating various disorders, and showed the research facilities available, with electronic equipment being used in various experiments.

The detailed discussion on asthma research protocol ended with valuable suggestions and guidelines. A research team was constituted, headed by Dr Swami Aparnananda Saraswati to assist in the extensive five-year research program. A team of regional coordinators was selected from amongst the participants to assist the travelling YRF team which will conduct Yoga Asthma Camps in specific areas throughout India.

YRF Case Report

The subject had suffered from constant wheezing, breathlessness on exertion and morning cough since 1968. This was diagnosed as bronchial asthma in 1971. His condition worsened in winter (October–January). Before commencing our course he used an asthalin inhaler during an attack and ayurvedic medicine as prophylactic.

Mr. X stopped medication completely during the course and experienced no attacks. When tested spirometrically at the conclusion of the course, his vital capacity had increased from 1.53 litres to 2.45 litres, forced vital capacity rose from 1.69 litres to 2.25 litres, forced expiratory volume at one second rose from 1.26 litres to 1.62 litres, forced expiratory volume at three seconds increased from 1.69 litres to 2.24 litres, peak expiratory flow rose from 2.99 litres per second to 4.42 litres per second and mid-expiratory flow increased from 0.96 litres per second to 1.16 litres per second.

One month after completing the course he wrote:

Respected Swamiji,

I had attended the Health Management Course from 16.12.88 to 29.12.88 for treatment of asthma and I am doing the practices as I was taught in the course.

For the first 20 days I did bhastrika but then I found some blood in my nose in the morning, so I discontinued. (*Patients had been warned not to practise bhastrika too forcefully or when the room temperature or body was too hot*).

I have had no attack in the past month (*usually part of his worst period*) and I have completely stopped taking medicines. I am taking my meals early, sleeping early and getting up early and I am feeling fine.

Hari Om
Mr. X

(Names of subjects are confidential)

Survey of the Effects of Yoga on Common Disorders

Courtesy of Dr Swami Mangalteertham

The director of the Yoga Biomedical Trust in Cambridge, England, is Dr Robin Monro, a molecular biologist. His asthma was cured by yoga, thereafter he decided to devote the rest of his life to scientific research into the therapeutic applications of yoga and founded this institution in 1980.

In 1982, as part of a project to examine the effect of yoga on common disorders, they sent 10,000 questionnaires throughout the United Kingdom to all the yoga teachers registered with the Yoga Biomedical Trust. The questionnaires were to be given to the students of the yoga teachers, but only to those who were undergoing yoga therapy and no other form of therapy, for their ailment.

Approximately 3000 completed questionnaires were received. Data was analyzed with the assistance of the Indian Institute of Technology, Madras.

Analysis showed the majority of respondents were in the age range 22–70 years and had been practising yoga for 1-9 years for about 2–7 hours per week.

89 % believed that yoga had increased their general sense of wellbeing.

69% believed that yoga had increased their energy level.

55% believed that yoga had increased their general working capacity.

45% believed that yoga had decreased their susceptibility to colds and flu.

Statistics for days off work on sick leave, consultations with doctors, consumption of medicines, tranquillizers or sedatives were not significant.

Various disorders are listed for which patients answered 'yes' or 'no' to the question: 'Has yoga helped?' The number

of cases in total, is followed by the percentage of those who replied 'yes'.

Disorders	Total No.	% 'Yes'
Back disorders	1142	96
Asthma or bronchitis	228	88
High blood pressure	150	84
Heart disorder	50	94
Duodenal ulcers	40	90
Haemorrhoids	391	68
Diseases of nervous or muscular system	112	96
Cancer	29	90
Diabetes	7	86
Rheumatism or arthritis	589	90
Pre-menstrual tension	848	77
Other menstrual disorders	317	68
Menopausal disorders	247	83
Obesity	240	74
Migraine	464	80
Insomnia	542	82
Excessive anxiety	838	94
Heavy smoking	219	74
Alcoholism	26	100

Such results indicate the many other areas in which future research studies on yoga's therapeutic role may venture.

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Editorial

Swami Satyananda Saraswati

Yoga can manage many diseases, especially the chronic and functional types. When I started the International Yoga Fellowship Movement in 1962, I had plenty of background with yoga therapy. I had lived from 1943 to 1956 in Rishikesh at the foot of the Himalayas with a very eminent sannyasin, Swami Sivananda, who had been a medical doctor in the earlier period of his life. I used to be his secretary, typist, editor and translator.

My contact with spiritual life was through philosophy, Vedanta, and that developed the desire to discover the higher consciousness within myself. When I lived with my guru and did a lot of work for him, especially typing, I used to read about the yoga postures, pranayama and other hatha yoga practices. I wondered if, when you practise sarvangasana, the thyroid is really stimulated, or when you practise sirshasana, if it really is true that the pancreas is stimulated. Frankly speaking, the claims made for yoga did not convince me.

I had my own background of medical studies, not with humans but with animals, because my family were preparing me to be a veterinary doctor. To me, these statements made by an ex-medical man were not convincing, but I kept them in my mind, and during the twelve years of my ashram life I was mainly engaged in studying philosophies, eastern and western, as well as the newer philosophies and psychologies.

People used to write to Swami Sivananda for treatment of their problems, and he used to suggest that they practise yoga. I used to witness all that, then in 1956 when I was wandering all over India, Burma, Nepal, Afghanistan, Ceylon as a mendicant, people used to come to me to ask what yoga they should practise to become free from their diseases. I did not know very much about it, so I retired again and studied yoga thoroughly. I learned that yoga is not just a series of exercises. The practices are postures or asanas which produce

a great change in the body; sometimes in the main organs, sometimes in the endocrine secretions and sometimes in the nervous system.

Balancing the energies

The body is maintained by the life force and the mind is maintained by the mental force; this means that there are two forms of energy in this organism. One form of energy is responsible for the maintenance of the gross organs of the body, and the other force is responsible for the mental activities.

When you practise yoga postures, particularly the major ones, they exert mild pressure on the six important junctions in the spinal passage. Of these six, four distribute the life force and mental force; and disease is caused by an imbalance of the energy quantum of the body.

Now of course we talk about bacteria, vitamin deficiencies, and there is no argument about it. However at the same time you must remember that a disease does not merely originate in the gross body. Even if a disease does appear to originate in the body it travels straight to the mind and from there back to the body again. Such diseases are known as 'somopsychic' diseases. Most diseases nowadays originate in the mind; then they travel to the body, then from the body to the mind again. This is how every disease originates, spreads and comes back again. Therefore whatever the origin of a disease, man's body and mind both suffer at the same time.

These two forces are functioning just like material forces; you can say for the time being, positive and negative forces. The negative force controls the mind and its functions, while the positive force controls the body, its temperature, mobility, etc. The two forces are distributed throughout the body via the four junctions which are situated in the spinal axis, at the sacral area, cardiac area and cervical area. These junctions are known as *chakras* or psychic centres. For proper health these four energy centres must maintain balance; if the balance is lost then disease of that particular system originates.

I'll explain this a little more. In yoga we call life force prana. Other translations are vital force and bio-energy (though prana is something more than this as well). In life there should be harmony between the pranic force and the mental force but usually this doesn't happen. If pranic force dominates and mental force becomes subservient, then mental illness occurs. If the mental force becomes predominant and the pranic force is subservient, then physical disease occurs. In modern medical language we speak of the same thing; when the parasympathetic nervous system is subservient or vice versa, we have either psychic or physical disorders. If a harmony could be struck between these two forces, the sympathetic and parasympathetic systems, then there would be perfect health in the body.

Endocrine glands

When there is total harmony between these two systems then there are also perfectly balanced secretions of the endocrine glands. These glands are either directly or indirectly controlled by the energy systems, so an energy imbalance directly or indirectly affects that particular gland.

For instance, in diabetes the pancreas ceases to function, insulin is not produced and so glucose breakdown is interrupted. The nervous system goes into dysfunction on account of stress and strain but if proper rest and relaxation can be given to the nervous system it will recommence functioning, consequently the pancreas will start working and that is the end of diabetes.

The body makes its own medicines

Within this physical body there are rich sources of life-giving chemical antibodies, etc. When we need one of them we can take it from outside via pills or injections, but if we revitalize the particular system that produces these requirements we can make them for ourselves. That is what we can accomplish through yoga.

Take the example of adrenalin. The patient who is suffering from asthma can produce adrenalin by simply practising one posture known as shashankasana. The person sits on his feet,

bends forward, places his forehead and arms on the floor and relaxes in this position for ten or fifteen minutes. This is the way the Muslims sit during their prayers. In shashankasana the adrenal glands are reactivated, they secrete more adrenalin and the attack passes off. This is especially effective if it is practised as soon as the person knows that the respiratory congestion is beginning to take place. An asthmatic patient can tell very well when an attack is starting. The condition often begins to accumulate from the morning and he begins to feel heaviness in the chest, but if he practises this posture he begins to feel better very quickly, because the secretion of adrenalin is increased. Everyone with asthma knows that if he has an attack and goes to the doctor he is given adrenalin, however with shashankasana he makes it for himself.

This is an example of how a particular endocrine gland is stimulated by the practice of a specific asana. The endocrine glands in their turn then influence not only the body but also the emotions such as anxiety, fear and anger, which can also be controlled by yoga practices.

Peptic ulcer

When I started this movement I had 24 students and one of them was suffering from peptic ulcer. He was a very brilliant advocate and an astute politician. At the beginning his ulcer was very bad and it was hard for me to imagine how yoga could help a condition caused by hyperacidity, anxiety and fear and irregular lifestyle. 'Exercises' for me were only exercises after all, whether they were dynamic or static. To my surprise however that man got better within fifteen days and he is all right even now.

Heart disease

The experience with the advocate compelled me to follow a series of studies on yoga. I contacted various authorities in my own country and in Europe, America and Australia and inspired them to study these phenomena. I helped one team to thoroughly examine the impact and effect of yoga postures

on coronary diseases, which was a very important subject for me. I went to the central government in Delhi and met the ministers and other chief officers in an endeavour to finance the project. They were very glad to do that and granted a large sum of money and facilities in a medical college, along with the permission to examine and instruct the heart patients. They also gave an office, electrocardiographic facilities and a yearly subsidy for recurring expenses.

Many eminent doctors followed these observations during a period of five years and examined more than 950 patients, men and women with all kinds of coronary diseases including angina, thrombosis and myocardial infarction. The report was finally compiled, published and handed to the Government of India.

With the report on coronary diseases a great awakening took place in my country. Many doctors began to follow yoga courses and we have formulated a systematic course for the different diseases of the heart. As a result, in our ashrams all over the world, yoga therapy is one of the most important activities.

Talking about heart patients, it is a well-known practice that before a medical expert is called for a heart problem, the patient is made to lie down on the floor with his legs raised on a pillow. The blood goes back to the heart and the pressure and strain on the heart is relieved, no matter what the complaint is. Thus the heart can function until the medical expert arrives. This is a very simple thing which can be taught to everybody. Wherever I go, if I meet people over forty, I tell them that this is one practice they must learn.

Of course, in India heart disease is not a major disease, whereas in the West it is the number one killer. In India only those who are following the modern way of life, sitting in a room all day and not going out, suffering from anxiety, insecurity, stress and strain etc., have heart attacks. In the villages people do not understand what a heart attack is. They are very simple folk. They go to sleep on time and get up on time, take proper food and exercise, just as the body requires.

Siddhasana and the heart

Recently I met an eminent doctor who is a great authority on transplanting the heart, Dr Christian Barnard from South Africa. We started talking about yoga postures and he said, "Yes, that is what I tell people to do because if yoga postures are done correctly you don't have to worry about heart attacks at all." When I asked him what was the basis of his statement he said, "In the male body testosterone is produced and these hormones attack the heart." Testosterone is the hormone secreted by the testes in the masculine body. It is secreted every now and then, consciously and unconsciously during sexual intercourse, sexual fantasies, etc. If there is a nice dish of food the salivary glands start to work, you know that. Even if I talk to you about something which you like to eat most, the saliva begins to flow; this is a normal body reflex. In the same way, if you look at a picture of sexual activity, for instance, it is not just looking – there is a reflex action set up in the body and testosterone is secreted. I'm not criticizing the sexual behaviour of man, I'm only defining testosterone in relation to human activities.

If testosterone attacks the heart how can we be sure it is not produced in excess? Dr Barnard said that he had one posture in mind which he described as siddhasana, the posture in which we sit for meditation. In this posture the left foot is placed under the scrotum with the right over the genital organ. If this is practised for say half an hour maximum each day it will give you complete control over the secretion of testosterone, a primary cause of heart attack. This revelation I am making is from a very respected person in the field of heart treatment, therefore there is no reason why siddhasana should be considered just a meditational posture. Let us call it 'the coronary posture'.

When you are practising siddhasana, what is happening? You are pressing the perineum between the excretory and the urinary organs with your left heel. With the right heel you are pressing the lower abdominal viscera at the root of the urinary organ, or in the female body, just above the clitoris.

You are pressing these two points which are very important in controlling the flow of blood through the arteries and veins. The posture of siddhasana helps in the treatment of abnormal blood pressure too. Anyone who is suffering from high or low blood pressure should just sit in this position for an hour if possible, or for half an hour and the blood pressure will slowly move towards normal. This is because the pressure on the viscera and the perineum is transmitted to the brain centres, which control the blood pressure. High blood pressure is caused by tension and stress reacting through the brain and affecting the blood vessels and the heart. There are of course other ways of controlling high blood pressure but now I want to emphasize how important siddhasana is to our age.

Diabetes

Here in India, along with heart disease, another important experiment has already been concluded in the management of diabetes. The course was conducted in one of my ashrams for forty people, under the direct observation of doctors. When the course was concluded the patients went home and the doctors followed up their progress. To sum up, this experiment enlightened the whole nation by proving that diabetes is no longer an incurable disease, and if properly handled, before complications have set in, the pancreas can be regenerated and the disease can be checked. The sufferer from diabetes has nothing to worry about provided he knows the correct practices to do.

In the same way during the last fifteen years we have seen studies covering a wide range of diseases being conducted all over the country. Asthma, indigestion (the mother of many diseases), polio, muscular atrophy, multiple sclerosis (one of the widespread diseases in the West) and many other illnesses have been found to respond to yoga therapy. Today in India, yoga is one of the most important branches in healing. The Medical Association has asked the medical colleges to include the teaching of yoga therapy in the medical studies. Medical doctors come to our ashram in Munger from all parts of India

in order to get an introductory idea of the major principles of yoga therapy. There is also work being done on yoga therapy in Australia, Belgium, America and other places.

Prolapse of the uterus

I don't know much about the condition of ladies in the West, but in India many ladies suffer from prolapse of the uterus, where its supports become weak and it comes down. Of course we have a system of surgery for this, but in yoga we use only three postures practised over a period of time, which bring the whole genito-urinary system into working order and make it strong.

One practice is called *naukasana*, the boat pose. You lie down, raise both legs a bit and tense them, then raise the upper part of the body a bit off the floor and tense it, then stretch the arms in the direction of the feet and make them tense. It has been seen that during this pose the uterus drops back. It may not happen in a few days, it may take a period of time, but definitely this posture helps in prolapse.

The other practice for prolapse is *uddiyana bandha*. Exhale through the mouth, empty the lungs and contract the abdomen upward and backward. At the same time the kidneys, the bladder and the uterus follow the same contraction. The entire genito-urinary and digestive tracts are contracted. When at the same time you block the throat by extending the arms and pressing the knees in *jalandhara bandha*, the blood circulation is concentrated in the navel region, and we know that wherever the blood concentrates, repair work takes place very fast.

Cancer

I don't make very tall claims, it is not my habit, but I have seen for myself how cancer can be successfully treated by yoga therapy. For instance one of my friends brought me a patient, the son-in-law of a multi-millionaire who was himself an eminent medical doctor in India, an FRCS. He had been in London and had to be brought back to India because of cancer of the spine.

He came to us and we only recommended one practice, revitalizing the breathing. He had to do nothing but fold back the tongue toward the upper palate (khechari mudra), then practise a particular pranayama called ujjayi, in which the breath sounds like the steam escaping from an engine. This is known as psychic breathing. With his eyes open or closed he was instructed to breathe this way fifty, one hundred or one hundred and fifty times.

First of all he was very sceptical. He asked, "Will it cure me?" I said, "If there is any other system available which you think can cure you then take that course." He was himself a doctor and he had given up all hope of survival. I said, "Practise it with inspiration and enthusiasm." He practised for one full year or more and he is still very much alive today. He no longer has cancer but unfortunately he is not able to move his head either to the right or the left because of a certain test he had undergone before he met me. I advised him, "Don't worry. If you persist in practising these other yoga postures, in the course of a year or two your neck will be able to move again." I haven't seen him since, but I am sure that even if he cannot move his head as easily as I can, he can at least look a little from side to side.

He is still the Dean of the Faculty of Medicine in a well-known university. He tells all his medical students that yoga is important, not only as a philosophy or a spiritual science, but because there are certain physical changes that definitely occur.

Rheumatoid arthritis

I will finish this introduction with one more disease. Last month I received a request from the Education Department of my state to train secondary school teachers. We wanted to find out what had happened to the government officers. Why did they suddenly become aware of the benefits of teaching yoga in the schools? What was the story behind it? Here's what happened.

One of the sons of the Chief Secretary of Education was suffering from rheumatoid arthritis. He was brought to our

ashram but I was not prepared to accept him because he had to be looked after completely. He could do nothing. He was virtually a dead man enacting life. I was not prepared for him because, although I have a very big ashram, people rush here and there and consequently we are often hard-pressed for accommodation. However, some of my disciples knew the boy and intervened on his behalf, so I kept him and his mother also for three months.

I didn't know whether he experienced any improvement because I went out on tour during this period. When I returned he was no longer there and I forgot the affair completely. A few months later he came back and he could walk. He came in, bowed low and greeted me in Hindu fashion. This was the first I saw of his improvement. Recently when I was coming through Patna from an overseas trip he took leave of me and said, "Swamiji, next time I will come to the ashram alone." He now goes to the bathroom, takes his own bath, washes his own clothes, cleans his own plate, sweeps his own room and makes his own bed.

The father of the young man never expected this improvement because the medical experts had said, "Nothing can be done; you can go to England or America, they may have a way, but here in India we do not have a cure for rheumatoid arthritis." The Secretary of Education was thus so obliged that he spoke with his colleagues in the government. He reasoned that a science which could deal so successfully and so immediately with a condition such as rheumatoid arthritis should be taught to the teachers and professors so that they could in turn teach the children. In this way the next generation will have a better idea about the therapeutic possibilities of yoga.

The future of yoga

Yoga can move either side by side with medical science or independently. This is because we have a sound system of aetiology, diagnosis and pathogenesis of diseases. We have a complete system by itself within yoga. Unfortunately, people of the East and West have understood yoga as a science of

occultism, mysticism, black magic, witchcraft, and may have attributed it to the religious side of life. This is why yoga has been outside the area of scientific exploration and investigation. However, we are now doing a lot of work within India, not only in our institution but many others, and in Australia they are working very hard too. Australian doctors write down under their prescription: "Practise yoga." They don't know very much about the postures, but they know what yoga can do. Work is also going on in most European countries. I am particularly aware of what is going on in Czechoslovakia and Poland because my disciples there are working in collaboration with the medical authorities. Throughout the whole world, yoga is now becoming recognized as a science in its own right. I hope this systematic approach to yoga will reveal greater benedictions and greater benefits to mankind.

Asthma – Its Pathogenesis and Some Thoughts on Its Yogic Management

Dr Swami Mangalteertham (A.K. Ghosh), PhD (Cal.)

ABSTRACT: The nervous and biochemical factors involved in the pathogenesis of asthma are discussed from the point of view of the possible influence of yoga. Some epidemiologic evidence and personal teaching experience related to the effectiveness of yoga in the management of asthma is then presented.

Yoga has many therapeutic applications but is most effective in diseases with a recognized psychosomatic component, such as asthma. To understand how yoga can affect asthma it is necessary to know a little about the pathogenesis of this disease.

Basic pathogenesis of asthma and thoughts on the mechanisms of yoga

Present-day knowledge about the pathogenesis of asthma has clearly pointed out that the problem lies in hyper-responsiveness of the bronchus.¹ The cause of this hyper-responsiveness is an imbalance in the autonomic nervous system. We know that stimulation of the parasympathetic nervous system brings about bronchial constriction and that stimulation of the sympathetic causes bronchodilation.

The normal calibre of the bronchus is maintained by a balanced functioning of these systems, which both operate reflexively. The parasympathetic reflex loop consists of afferent nerve endings which terminate under the inner lining of the bronchus. Whenever these afferent nerve endings are stimulated (for example, by dust, cold air or fumes) impulses travel to the brainstem vagal centre, then down the vagal afferent pathway to again reach the bronchus. Acetylcholine is released from the afferent nerve endings.

This acetylcholine results in the excessive formation of cyclic Guanine Monophosphate (GMP). This initiates bronchoconstriction.

The sympathetic reflex loop consists of impulses travelling from the hypothalamus to end in the adrenal medulla and there to release epinephrine. Epinephrine is carried in the blood stream to the bronchus where it activates sympathetic receptors which in turn stimulate the bronchial cells to promote the formation of cyclic Adenosine Monophosphate (cAMP). This substance relaxes the bronchial smooth muscles. Of course, as the muscles around the bronchi relax, their calibre increases and air flows more easily.²

However, this delicate balance between cyclic AMP and cyclic GMP, which maintains the calibre of the bronchus, is also influenced by the activities of 'mast cells'.³ When allergens such as pollen, animal danders or skin, house dust, chemicals or drugs are taken up into the blood, the immune system of the body, considering them to be highly dangerous substances, wants to fight them away. In people with an abnormally sensitive immune system, large amounts of immunoglobulins (IgE and IgG) are brought to the site of the insult in the nose and the bronchi. Here allergens and antibodies may react on the surface of sensitized 'mast cells' lying on or underneath the mucus membrane.

This disruption of the mast cells leads to the release of chemical mediators stored within them. Some of these chemical mediators are: histamine, chemotactic substances, leukotrienes and prostaglandins. These chemicals upset cGMP-cAMP balance by acting directly on their lung receptors and or through the vagal receptors.

With this background we can suppose that yoga might affect asthma through the following mechanisms:

Yoga nidra by balancing activity in both hemispheres of the brain (as I established with Brain Electrical Activity Mapping experiments at Charing Cross Medical School in 1988) could lead to rectification of any disturbances in the autonomic nervous system.

Asana as a regular practice has been shown to induce certain biochemical changes, such as increased catecholamines and corticosteroids⁴ and it may be that here is one way that the biochemical imbalance could be altered.

Pranayama is renowned for increasing the vitality, what we in yoga call the prana. The vitality in asthmatics is low. If you see a Kirlian photograph of the hands and feet of a healthy person and beside them the hands and feet of an asthmatic, some interesting things can be noticed. There is no radiation at all from the feet of the asthmatic. Perhaps this confirms a general psychological assessment that some asthmatics may not have their feet firmly on the ground.

Also fascinating is dissection of the aura that occurs in the thumb of the asthmatic, the traditional site of the lung meridian according to acupuncture.

Nadi shodhana pranayama, alternate nostril breathing also, I believe, has a powerful affect on the autonomic nervous system. I did some preliminary work at Charing Cross Medical School (and I believe a report has already been published), showing the association between nasal flow and contra-lateral brain hemispheric activity.

Jala neti the passing of lukewarm saline water in one nostril and out the other by means of a *lota*, in my experience, is able to significantly reduce the effects of allergic rhinitis.

Kunjla with the powerful surge of vagal activity involved in the vomiting reaction probably also assists to rectify autonomic imbalance. Further, the strong downward contraction of the diaphragm and simultaneous contraction of all the abdominal muscles impulsively stimulated in *kunjla* are the very physiological reactions required to assist with expiration.⁵

Personal experience in the yogic management of asthma

On arrival, I announced throughout the Cambridge area and through local yoga teachers the availability of yoga classes for people suffering from complaints such as backache,

asthma, insomnia and anorexia nervosa. All these problems have a high psychosomatic component which makes them particularly suitable for yoga therapy. I ended up teaching a class of about nineteen asthmatics on Saturdays. This lasted for two years.

Instruction started with the pawanmuktasana part I series. This was most effective in loosening their joints and they said it made them feel 'more relaxed and energetic'. The more dynamic pawanmuktasana part II and surya namaskara were only given to the younger subjects, after a couple of weeks of the course.

The older subjects did not like surya namaskara. They said it made them feel tired, less energetic and caused heavy breathing. All patients felt less tense and more energetic after pranayama: nadi shodhana, bhastrika.

Kunjla and especially jala neti was found particularly useful in drainage of mucus. It was a regular event for patients to go outside to clear their nose. We even designed a plastic neti pot to meet the continuing demand.

Yoga nidra was found particularly beneficial in inducing deep and relaxing sleep. I also utilized a practice where during an attack patients sat on the floor and rested their heads in the crook of their arm on the seat. This helped to relax their breathing muscles, and to restore calm.

Some case reports

Let me now present some case reports illustrative of the way in which yoga therapy works with asthma.

Mr O.C. was aged 75 and had been suffering from severe bronchial asthma for 25 years. He used to wheeze and cough every night after 2 am and as a result he was unable to sleep well. He used to come to every class tired and exhausted. I suggested that he do chair-breathing at the time of acute attack. After resting his head on the chair in a curved posture, normal breathing would return in 10 to 15 minutes. Then he would lie down and play a yoga nidra tape.

To my surprise, the first day he reported that he had started snoring and had fallen asleep in 15 minutes. With one month's practice, slowly the duration and severity of attacks was reduced. He now has restful sleep and feels more energetic.

Mrs A.T. was aged 40. For 15 years she had suffered from bronchial asthma which was intense in the period of March to May. This is spring in England and pollens are thick in the air. She experienced a stuffed nose, heavy breathing and dry wheezing. She used to feel very heavy all along her eyebrows, forehead and sinus area.

I suggested that she do kunjal and neti every morning and take a hot bath. Regular practice made her more relaxed around the eyebrows, heaviness in the head was gone and she was no longer suffering from a stuffed nose. During the period of this practice she experienced no attacks.

Miss R.D. was aged 20. She had suffered from bronchial asthma for 15 years with a constant wheeze and a nose clogged with mucus. Heavy breathing and acute attacks used to come only in winter. I asked her to practise pawanmuktasana parts I and II, and surya namaskara. She said she found these practices very refreshing, and that she was feeling more 'energetic and relaxed' after regular practice.

After pranayama she used to go out of class and drain a large amount of mucus from her nose. I had also asked her to stop eating yoghurt (dahi) and banana. These foods are traditionally associated with excess mucus production according to yoga philosophy. After a few months the problem with her blocked nose had ceased.

Mr D.R., aged 35, had bronchial asthma, with wheezing cough, restless sleep and emotional disturbance for 15 years. I asked him to practise yoga nidra when going to bed. The very next day he came and embraced me saying, "Yoga nidra

is very powerful. I have never experienced such a calm, restful sleep in the present decade. When I started your tape I didn't know that within 10 minutes it would lead me to a deep sleep. When I woke up this morning it was 8 am. I felt very energetic and there was no asthma attack last night."

Afterwards he practised yoga nidra every night before going to bed. In a few months he reported feeling much more energetic. He had few attacks and those that came were of reduced severity.

So, this is a brief picture of the pathogenesis of asthma and some thoughts on its yogic management. For hard data on the subject we will have to await the results of the Yoga Research Foundation's five-year trial of the 'Effects of Yoga on Respiratory Disease'.

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Effect of Smoking, Running and Yoga on Total Cholesterol and Serum Lipoprotein Cholesterol Levels

Dr K.C. Khare, Dr V.C. Sanghvi, Dr M.M. Agrawal (Pub. in Yoga Mimamsa)

ABSTRACT: 128 cases, comprised of 44 runners, 40 smokers, 44 cases performing yoga, were studied for a period of three months regarding their effects on total cholesterol and serum lipoprotein levels. 20 healthy control subjects of similar age and sex group were matched with above cases. Their values were compared. Smokers have lower level of HDLc. HDLc has protective value for cardiac and cerebro-vascular disease. Bidi and cigarette smoking both are dangerous to health. Yoga training and running have definite value in lowering total cholesterol and LDLc and VLDLc. They also cause rise of HDLc. So this study demonstrates the beneficial effect of yoga on health.

Cholesterol in its literal meaning is known as bile alcohol. Cholesterol enters the blood as chylomicron and goes to the liver. From here both endogenous and exogenous cholesterol are carried to tissues as HDL, VLDL & LDL. Smith E.B. (1957) reported that after 3–5 days of acute myocardial infarction there occurs a rise in VLDL which reaches to its peak value in 3–5 weeks and then disappears. However, in contrast serum cholesterol levels fall in patients with acute myocardial infarction as it occurs in any acute illness. Bar et. al. (1951) earlier reported that there is inverse correlation in between HDL and coronary risk. Miller and Miller (1975) also confirmed the above observation.

Epidemiological studies suggested that the incidence of coronary heart disease is more in sedentary workers and it is lower in physically active men. The association between coronary heart disease and raised VLDL and

LDL is generally recognized. Exercise is known to alter the concentration. Wood et. al. (1976) have demonstrated that long distance runners have lower LDL and VLDL and higher concentration of HDL which in turn reduces the incidence of coronary thrombosis.

Peter Williams (1979) observed inverse correlation of HDL to cigarette smoking and thus increased incidence of coronary thrombosis.

Yoga practices rehabilitate sedentary workers and the effect of yoga on HDL and other lipoproteins has not been studied up till now.

Keeping the above point in view this study has been undertaken in this centre to prove the efficacy of running and yoga training and the influence of smoking on HDL and other lipoproteins.

Material and method

The present study was carried out in the department of Medicine, Respiratory Clinic of M.Y. Hospital M.G.M. Medical College, Indore. Candidates included in this study were mainly divided into 2 groups:

1. Control group consisted of 20 healthy volunteers selected from amongst doctors' relatives and paramedical staff.
2. Study group comprised of 3 sub-groups:
 - a) Chronic smokers – 40 cases who were chronic smokers were selected from M.Y. Hospital outdoor. They were selected after their routine health check-up and special care was taken to exclude any symptomatic disease in them.
 - b) 44 runners were included in this study. Male runners were selected from police training school, Indore. Duration of running of all of them was between 5 months to 10 years.
Female runners were selected from Law College and K.P. College, Dewas. Duration of running was 4–7 years.
 - c) In the yoga group 44 individuals, both male and female, were taken up for the study from Geeta Bhawan Yoga Centre.

Their values were studied before and after completion of 3 months of training.

The yoga exercises included:

1. Prayer – 2 minutes
2. Surya Namaskara – 5 minutes
3. Sharir Sanchalan – 8 minutes
4. Asanas – 20 minutes
5. Pranayama – 15 minutes
6. Dhyana – 15 minutes.

In all the cases detailed, personal history regarding diet, occupation, tobacco-chewing were noted. History of drug intake was noted and care was taken that patients who were taking drugs were excluded from this study. Cases were matched in the age group. A thorough clinical examination was done in all the cases.

Routine investigations included Hb, blood T & D urine examination, blood sugar (fasting) ECG and X-ray chest.

Special investigation included estimation of total cholesterol, HDL cholesterol, LDL cholesterol and VLDL cholesterol. The method of measuring total cholesterol was based on the principle of McIntyre and Ralston (1954).

The estimation of HDLc, LDLc and VLDLc were done by principle of Wilson Spinger (1973).

Observation – I

In this study the following groups were studied in detail depicting the values of total cholesterol, HDLc, LDLc and VLDLc.

	<i>Male</i>	<i>Female</i>	<i>Total</i>
Control Group	15	5	20
A. Runners	38	6	44
B. Smokers	35	5	40
C. Yoga	32	12	44

Discussion

Serum lipoprotein concentration, specially VLDLc and LDLc levels, are important in development of atherosclerosis. However, Ader G. Olsson (1979) pointed out that high concentration of HDLc is related to decreased atherosclerotic disease. Alon and Donald in (1978) formerly suggested that HDLc causes removal of cholesterol from arterial wall and further it reduces binding of LDLc to febroblast so it helps in degradation of LDLc.

HDLc concentration varies from person to person. These levels are increased after exercises such as running. HDLc level decreases after smoking for a long time and sedentary habits.

Control group

Our study showed that total cholesterol was higher among 40–60 years (210.4 mgm percent) as compared to 20–40 years male (187.7 mgm percent). HDLc level were also higher in the younger age 20–40 years male group (50.6 mgm percent) as compared to 40 years (41.6 mgm percent). The changes in HLDc level did not correlate with the study done by Peter William (1979) who found no change HDLc with the age.

LDLc and VLDLc level were 147.7 mgm percent and 21.4 mgm percent in 40–60 years. This is a statistically significant higher value as compared to 20–40 years age group.

Study group

a) *Runners*: Total serum cholesterol showed significant decrease ($P < 0.05$) in female runners as compared to age-matched female control. In male runners a new significant change has been observed. An earlier report of Rona Hurter (1972) also suggested that no change of Tc occurs after running. HDLc levels were significantly higher (P value 0.05) among male and female runners.

HDLc/Tc ratio showed a higher significant value amongst female runners. The male group also showed higher values, but statistically they are insignificant.

TABLE 1

I: CONTROL GROUP – 20 Cases

<i>Age in yrs.</i>	<i>Total cholesterol</i>	<i>HDLc</i>	<i>LDLc</i>	<i>VLDLc</i>
20–40 yrs.	183.7±27.76	50.6±5.92	115.1±26.49	18±4.61
41 yrs. and above	210.4±10.18	41.61±4.33	147.4±11.32	21.4±3.13

From the above table it is evident that total cholesterol and low density lipoprotein cholesterol increases with the age in control group whereas HDLc decreases with the advancement of age.

II: STUDY GROUP

a) *Runners* – 44 cases

	<i>Total cholesterol</i>	<i>HDLc</i>	<i>LDLc</i>	<i>VLDLc</i>
<i>Male runners</i>	178.71±71	56.52±6.99	100.94±13.8	21.15±6.75
<i>Female runners</i>	163±6.87	57.66±6.37	92.5±9.6	18.93±5.26

This shows that there was marginal increase of HDLc in runners of both sexes.

b) *Smokers* – 40 cases

	<i>Total cholesterol</i>	<i>HDLc</i>	<i>LDLc</i>	<i>VLDc</i>
<i>Male</i>	192.6±26.36	47.6±6.87	125±27.13	19.13±4.38
<i>Female</i>	178.4±15.96	42.6±5.81	118.2±10.98	17.6±5.91

This suggests that there was decrease in HDLc in both sexes.

c) *Yoga group* – 44 cases

	<i>Total cholesterol</i>	<i>HDLc</i>	<i>LDLc</i>	<i>VLDLc</i>
<i>Male</i>	182.42±27.10	49.3±7.21	117.7±28.4	115.4±6.31
<i>Female</i>	165±13	54.8±1.61	96.8±10.75	13.4±4.09

In yoga group the total cholesterol and HDLc were compared before and after 3 months of practices of yoga in the same individuals. The results of values are shown as below.

1. Mean absolute values of Tc and fractional lipoprotein cholesterol and ratios in male yogis before and after training.

	Tc	HDLc	LDLc	VLDLc	HDLc/Tc	LDLc±VLDLc HDLc
Before	199±25.06	44.6±6.53	134.1±26.94	23.7±8.05	0.23±0.05	3.577±1.083
After	182±27.1	49.3±7.2	117.7±28.4	15.4±6.31	0.277±0.063	2.828±1.14

2. Mean absolute values of Tc and fractional lipoprotein cholesterol and their ratio in female yogis before and after training.

	Tc	HDLc	LDLc	VLDLc	HDLc/Tc	LDLc±VLDLc HDLc
Before	179.8±17.06	52.4±3.91	108±14.91	20.8±37	0.29±0.015	2.454±0.22
After	165±13	54.8±1.64	96.8±10.70	134±4.09	0.332±0.032	2.016±0.283

3. Mean absolute values of Tc and fractional lipoprotein cholesterol and their ratio in females.

Type of case	Age group	Tc	HDLc	LDLc	VLDLc	HDLc /Tc	LDLc±VLDLc HDLc
Control	20–60 yrs	178.4 ±15.96	42.6 ±5.81	118.2 ±10.98	17.6 ±5.94	0.236 ±0.02	3.214 ±0.36
Smokers	20–60 yrs	194.6 ±16.6	43.6 ±7.79	125.4 ±18.68	25.6 ±5.85	0.228 ±0.053	3.594 ±0.978
Runners	20–60 yrs	163.0 ±6.87	51.66 ±6.37	92.5 ±9.6	18.83 ±5.26	0.32 ±0.031	2.19 ±0.57

Significance of difference in males (P. value)

	Tc	HDLc	LDLc	VLDLc	HDLc /Tc	LDLc±VLDLc HDLc
Yoga before and after	0.0001	0.01	0.001	0.001	0.001	0.001
Running vs Yoga	0.1	0.00	0.1	0.05	0.05	0.05
Smokers vs Yoga	0.001	0.001	0.001	0.001	0.0001	0.000

Significance of difference in females (P. value)

	Tc	HDLc	LDLc	VLDLc	HDLc /Tc	LDLc±VLDLc HDLc
Yoga before and after	0.05	0.1	0.05	0.05	0.05	0.05
Running vs Yoga	0.1	0.1	0.1	0.05	0.05	0.05

The exact mechanism by which HDLc levels are increased in runners is of debatable opinion but it has been found that running induces increased sensitivity of insulin to adipose tissue and this increased lipoprotein lipase activity which in its turn causes increase in HDLc concentrate (Nikilla 1978).

There was no difference in levels of HDLc, LDLc and VLDLc found between male and female runners. In our study, we find no change of Tc, HDLc, LDLc and VLDLc both in the distance of running or duration of running. Both these factors need further elaboration by doing clinical studies on large cases.

b) *Smokers*: In this study there was significant rise in serum cholesterol in male smokers of all age groups as compared to non-smokers (P value 0.05). The exact mechanism by which cholesterol is increased in smokers is not known even today but Alfred Kershebaum and Samuel Ballet (1964) postulated that due to smoking there is increase in lipid fraction in the liver which may act as a stimulus for the production of cholesterol.

Total cholesterol values did not change in female smokers as compared to female control group. The possible explanation may be that these females were consuming less numbers of Bidis/day as compared to their male counterparts.

HDLc levels were decreased in the male smokers which are statistically significant (P value 0.01). Similar was the finding obtained by Ingutubes (1982) and David Robinson (1979). In female smokers no changes were observed. Serum LDLc and VLDLc were higher in male smokers whereas female smokers did not show any change. The ratio of LDLc/Tc was lower in male smokers as compared to control group which is also statistically significant. Similarly HDLc+VLDLc/HDLc was higher amongst male smokers (4.38 ± 1.69) which too is statistically significant. Similar were the results obtained by Anders G. (1979).

In this study it has been evident that the number of bidi or cigarette smoking/day had influence on lowering of

HDLc. We found that those male patients who were smoking more than 20 cigarettes or bidis/day had more lowering of HDLc/Tc ratio (33.83 ± 3.92) as compared to those male smokers who were smoking less than 20 cigarettes or bidis/day (40.41 ± 6.58).

Duration of smoking had also influenced the lowering of lipoprotein levels.

Total cholesterol was increased in persons where duration of smoking was more than 11 years. The HDLc was also diminished in them. The level of LDLc and VLDLc did not alter with the duration of smoking. The above effect of alteration in the levels of total cholesterol and HDLc suggests that longer duration of smoking is detrimental to health.

In this study we also compared the levels of HDLc in cigarette and bidi smokers. We thought earlier that cigarettes were more detrimental than bidis, we found that bidi smokers had more lowering of HDLc (38.05 ± 6.48) as compared to cigarette smokers (43.75 ± 6.13).

These values are statistically significant. This study clearly shows that bidis are more dangerous than cigarettes although both have injurious effect on health.

c) *Yoga Group*: In this study, we have compared the serum lipoprotein levels in patients before and after the practice of yoga. The duration of yoga practice was 3 months.

The levels of total cholesterol after training of yoga in all the cases were significantly lowered as compared to levels before training which were also significant. This suggests that yoga practices definitely cause a decrease in serum cholesterol.

Our study also showed that HDLc had a significant rise after training of yoga practices in male subjects whereas in females the levels of HDLc remained constant. Rise of HDLc levels are of protective value. Our results are in contrast to the finding of C. Bhaskar Jarayalu who did not find any change in HDLc after pranayama.

The explanation could be that our candidates were doing both asanas and pranayama while her cases were only practising pranayama.

The level of LDLc and VLDLc were decreased in both sexes after yoga training as compared to their initial value which is also statistically significant. These findings are in full agreement with C. Bhaskar Jarayalu.

No other study has been done to correlate yoga training with levels of serum lipoproteins. So our study stands to be second in the published literature about yoga and its related scientific research.

Comparison of runners and yoga group

Both runners and yogis showed similar levels of serum lipoproteins and total cholesterol, hence individuals, who are not in the habit of running, could take up simple yogic exercises to prevent the high risk factor.

Running, if started after the age of 40, may show some detrimental effect on the health, hence yoga practice which can be started in any age group without any detrimental effect on health is more recommended as a measure to prevent high risk factor to avoid cardiac and cerebrovascular complications.

Summary and conclusion

1. Estimation of Tc, HDLc, LDLc and VLDLc were done in 20 control groups. The values are as follows:

$$\begin{aligned}\text{Tc} &= 192.6 \pm 26.36 \\ \text{HDLc} &= 47.6 \pm 6.87 \\ \text{LDLc} &= 125.86 \pm 27.13 \\ \text{VLDLc} &= 19.13 \pm 4.38\end{aligned}$$

2. 128 cases comprised of 44 runners, 40 smokers and 44 cases performing yoga were studied for a period of 3 months. The study comprised of levels of serum lipoprotein, cholesterol.
3. Smokers have lower levels of HDLc as compared to non-smokers. Bidi smoking is more injurious to health. Duration of smoking and no. of cigarettes or bidis smoked also influenced the HDLc levels in them. In this study

female smokers had no alteration in serum lipoproteins. The possible explanation may be that they were smoking less numbers of bidis/day as compared to the male group.

4. Running has definite value in lowering total cholesterol and LDLc and VLDLc. It also causes rise of HDLc.
5. Yoga training definitely induces significant lowering of total cholesterol, LDLc and VLDLc. This training also induces rise of HDLc. There was no significant difference in Runners and Yoga Group as far as their values of serum lipoprotein are concerned.

Thus, this study clearly shows that running or yoga have definite beneficial effect in preventing risk factors. Further this study also shows that those individuals who are not in the habit of running could take up simple yogic exercises to prevent the high risk factor.

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The Torch of Yoga-Knowledge Illuminates the Way

Dr Swanand Chatpande (Published in Ravivar Sakal)

ABSTRACT: Bihar School of Yoga inspires an awareness, not only about the abundant treasures of knowledge in our ancient yoga shastras, but also passes on the benefit of that knowledge in daily life.

An introduction to 'Bihar School of Yoga' as well as to its research work and the conclusions thereof.

Swami Satyananda of Bihar School of Yoga is a great sage of modern times, who has proved scientifically the tradition set by Maharshi Patanjali, the founder of Yoga Science among Indian sciences. An ashram consisting of five to six rooms in a tiny campus founded by Swami Satyananda twenty-five years back through the inspiration from Guru Sivananda, is the modest origin of Bihar School of Yoga. Today, this ashram is spread in a large area along the banks of the river Ganga. The total credit for this goes to Swamiji. Many learned disciples coming from Swamiji's ashrams spread all over the world, and well-qualified doctors, engineers etc., striving only for the wellbeing of humanity, are treating thousands of people suffering from sorrow and disease, while leading the lives of sannyasa themselves. This institution, unifying yoga and modern science with a subtle vision, provides a subject of curiosity and research for the western world.

The unification of yoga and science

My mind was stormed with many thoughts, when I, as a doctor, received an invitation from this ashram to attend a symposium on 'Yogic Management of Asthma' scheduled to be held on 10th February '89. For this, I was required to go to a place called Munger, about 120 km away from Patna in Bihar and situated about 2000 km away from Pune. I

had already studied many books on yoga and therefore was wondering what new knowledge was there in store for me, but I had read the book in English entitled *Yogic Management of Asthma and Diabetes*, written by Shankardevananda, a doctor disciple of Swamiji from Sydney (Australia). Also I had myself experienced how yoga helps on a scientific basis by curing not only the physical disease, but also successfully eradicating mental distress, the root cause, which gives rise to the disease. In this book, I have studied very thoroughly the section about modern medicine and its shortcomings.

Ultimately, I set aside all other problems and decided to go to Munger with Nachiketa's enthusiasm for knowledge, as described in the Upanishads. This was the same Munger village, which was rocked by a formidable earthquake in 1988, but the seven-storeyed Ganga Darshan building of the ashram was standing magnificently firm like a yogi who has conquered all the passions. I was hoping to meet Paramahansa Satyananda, but he had adopted the life of a parivrajaka and therefore, I was disappointed; but I had the opportunity of meeting doctors like Swami Karmananda Saraswati and Swami Aparnananda.

Kirlian photography

A learned Swedish lady psychologist presented a very interesting and informative narration on 'Kirlian photography', a technique yet in the experimental stage, which tries to prove the effects of the states of mind on the aura of the body. This technique has proved that every living and non-living thing has its own 'aura'. This aura undergoes a change long before the onset of the disease in living beings. From the yogic point of view, this aura in living beings is the symbol of pranic energy. The pranic energy diminishes before the onset of a disease and the actual disease arises much later. This means that the Kirlian technique can foretell any disease before it actually attacks the body and it may be possible to prevent it from attacking the body by increasing pranic energy with the help of yoga. After

learning about this special discovery, I felt that my visit here was well rewarded, inspite of all the obstacles, and I thanked this institution a hundred times for enlightening me in this respect. There is a description in the Upanishads of various koshas like annamaya kosha, pranamaya kosha, vijñanamaya kosha and anandamaya kosha. All these koshas were dormant knowledge because of the backwardness of Indian research. Kirlian photography may have to be termed 'the first step taken by man to break this dormant state'. The only regrettable fact is that this step was taken in Russia and not in India.

Yoga nidra technique

I was fortunate to witness one more incident. Swami Satyananda's gift to the world is his adaptation of yoga nidra (psychic sleep) technique. This is a boon by Swamiji to the diseased body and mind. In yoga nidra, a patient or person is instructed to rotate his or her consciousness through the various parts of the body through specific instructions while in shavasana (corpse pose). This relieves mental stress and gives rest to the brain cells of the patient, thus eliminating mental distress and its subsequent harmful effects on the body. Yoga nidra works like magic on prevalent diseases like blood pressure, asthma, diabetes. The sankalpa (resolution) in yoga nidra diminishes emotional stress like fear and anger and creates an atmosphere congenial for curing the disease.

The brain cells transmit alpha, beta, theta and delta waves indicating various stages of mind. Out of these, alpha waves are indicative of peace, beta waves are those of distress, theta waves are those of the dream state and delta waves are those of deep sleep.

Dr Swami Mangalteertham who is studying neurographs with the help of a computer, imparted very enlightening information on this subject (Ed: the text of this talk was included in the last issue of YRF). The brain waves are converted into bands of various colours with the help of a computer. This helps one to understand quickly whether the

brain is at peace or distressed. The change in brain waves before and after undergoing yoga nidra can be shown with the help of a computer. Such slides were explained candidly by Mangalteertham to all the doctors. Many western doctors understood the importance of yoga nidra immediately because of this research in this field and it created an awareness of how deep the effects of yoga are and how intensely the modern world needs them.

The treatment of asthma

The Australian doctors claimed that asthma is more of a psychic disease than a physical one. They prepared a video film on this subject. They laid special emphasis on emotional release, relaxation through breath awareness, the necessity for straight posture of the spinal column, vitality and building of self-confidence.

Dr Varma, an eminent surgeon from Indore, presented six kinds of breathing with demonstrations. He reiterated his experiences about re-establishing the elasticity of the lungs. He also explained the effect of pranayama on ida and pingala nadis, the paths of pranic energy of the body from mooladhara chakra to ajna chakra.

A specialist hailing from Ranchi warned everybody, "I would not accept anything from swamis, knowing only yoga. Show scientific proof and then say whatever you want." At this point, Swami Niranjanananda, the chief of the institution, explained that, "Yoga Research Foundation, Bihar, is being established with this aim in mind and its first project will be the five-year study on the 'Effects of Integral Yoga on Bronchial Asthma'.

There are many patients who have been freed from the clutches of asthma with the help of yoga, but yoga has not yet received a certificate from the viewpoint of science. Therefore, the institution has undertaken this project to prove on a scientific basis that yoga not only cures asthma, but also does not allow it to come anywhere near the body by increasing the pranic energy of each and every cell. In

this project, about 10,000 patients will be treated during the next five years. Spirometric tests will be conducted (this test enables one to judge the overall efficiency of the lungs within two minutes) and information compiled in the form of computer data. With this, an asthma patient will be given a planned therapeutic yoga course like a standard medicine and will be cured. And the speciality of this cure will be that it will be forever.

The earlier inference of the western world was that asthma was a disease to be suffered from birth to death, all the way throughout life. Doctors also used to preach to medical students that asthma was definitely incurable. The surprising thing is that an Australian physician was himself suffering from a bad case of asthma and had been cured by the yogic therapy of the sannyasin Swamiji. The Australian physician accepted the path of a sannyasin in order to share his benefits with others. The book entitled *Yogic Management of Asthma and Diabetes* written by him under the guidance of Swami Satyananda is a proof of experience. This book is especially popular among the western medical community.

Only for spiritual evolution

In fact, Paramahansa Swami Satyananda founded this institution not only for curing diseases, because it was his guru's intense inspiration that spiritual evolution should be achieved through it. The cure of disease is just a token which he gives to everybody and after this you inadvertently devote yourselves to the path of yoga. *Yogaschitta vritti nirodhah* is his path and therefore this kind of yogi accepts the life of parivrajaka, (wandering and begging for subsistence) without falling prey to temptations of any kind.

The institution has published about 30–40 books on various aspects of yoga and it may be specially mentioned here that the maximum help for this has been received from the knowledgeable community from abroad. It is beyond doubt that this shining torch of yogic knowledge will guide not only the whole of Bharatvarsha but also the whole world.

All the cures through yogic therapy are not a mere coincidence. Yoga therapy has become so perfect that there is no need for the medicines for treating asthma and blood pressure. The question is to formulate yogic cures for these and many other diseases and to prove them scientifically.

Therefore, the institution has formed the Yoga Research Foundation. It is certain that the institution will be a guide, like the pole star, to all yoga lovers and especially the medical community, all over the world and will deliver the yogic wealth of health from house to house.

YRF News

The first course of the Yoga Asthma Study was held from 16th to 30th March 1989 at Ganga Darshan, Munger. Four people met the criteria as bronchial asthmatics with no complications, plus one subject with slightly elevated blood pressure. Dr Swami Aparnananda performed the physical examinations, Swamis Sambuddhananda and Vijayananda conducted the course and Swami Swayambodhananda operated the spirometer (lung function measuring equipment).

The first outside Yoga Asthma Study Camp was held in Barsi, a rural town in Maharashtra, from 31st May to 11th June 1989. It was organized by Dr C.B. Shitole and Shri S.B. Bhosalepatil through the auspices of the Karmaveer Dr Marnasaheb Jagdal Lokvidyapeeth, Barsi. Nineteen subjects were selected. The YRF team consisted of Swamis Dharmapoorna, Gurukripa, Jyotirupa, Sambuddhananda and Swayambodhananda, and they were assisted by doctors from the Jagdale Mama General Hospital.

The next Yoga Asthma Study at Ganga Darshan, Munger, was conducted from 16th to 30th June 1989. From the large therapy course, seven people met the strict criteria of bronchial asthma. Dr G.R. Namadev diagnosed and examined patients. Swamis Sambuddhananda and Gurumaya conducted the yoga course and Swami Swayambodhananda and Swami Jyotirupa operated the spirometer.

A training program was conducted for Regional Health Coordinators from 7th to 12th July 1989 at Ganga Darshan, for the preparation and understanding of procedures during a Yoga Asthma Study Camp. Many Regional Asthma Coordinators, both sannyasins and doctors, attended from all over India. The course was conducted by Swamis Sambuddhananda and Gambhirananda with several lectures given by Dr Swami Mangalteertham.

In September, a Yoga Asthma Camp was held at Jitpur Colliery Dhanbad, Bihar. from 1st to 10th September.

In this well organized camp, 24 mine workers were diagnosed as bronchial asthmatics. They participated with the assistance of doctors from the Jitpur and Chasnalla Hospitals, under the proficient direction of Mr O.P. Garg, the Area Manager. Volunteers from the colliery and a group of ladies contributed willingly. The YRF team included Swamis Muktidharmananda, Sambuddhananda and Swayambodhananda.

The September Yoga Asthma Study at Ganga Darshan, Munger, was conducted from 16th to 30th with 10 subjects drawn from all the corners of the continent. Swamis Sambuddhananda and Gurumaya conducted the yoga course. Dr Swami Aparnananda diagnosed and examined patients and Swami Jyotirupa operated the technical equipment.

The first Yoga Asthma Study Project is now underway in Victoria, Australia, with twelve subjects. Dr Swami Karmananda and Swami Muktibodhananda Saraswati of the Melbourne Yoga Therapy Centre are conducting this research project under the auspices of the Association for Yoga Research, Victoria.

YRF Research Update

Fundamental research

Fundamental research is being carried out periodically in YRF's experimental laboratory in the large Ganga Darshan complex. A brief summary follows:

1. An experiment to detect an increase in alpha waves through various meditative techniques, compared to merely sitting with eyes closed, was conducted. The following states were monitored on an EEG for ten-minute periods on various subjects:
 - a) Normal sitting with eyes closed
 - b) Repeating 'true/false' with metronome
 - c) Mental *Om* chanting
 - d) Loud *Om* chanting
 - e) Spinal breathing with *Om* chanted mentally
 - f) Frontal passage breathing with *Om* chanted mentally.

Results have been statistically evaluated and are being prepared for publication. Spinal breathing with *Om* showed the greatest increase in alpha waves.

2. Experiments on the hatha yoga practice of kunjla kriya or vaman dhauti as a bronchodilator are currently being recorded. First, a spirometry test takes place, then the subject practises kunjla. After a short time a second spirometry test is done. The results have been very positive so far, the effect of kunjla proving equal to that of an inhaler. These experiments are continuing.
3. Sheetali pranayama is being researched for its effectiveness in lowering blood pressure. To date, the results have been good and the final analysis is awaited. Further experiments with various pranayama techniques are continuing.
4. Some preliminary sleep and yoga nidra experiments were begun in August to detect the difference in brain wave patterns and consequently states of consciousness.

It became evident that a larger number of subjects over a cross-section of the community should be tested using more sophisticated monitoring equipment. Valuable knowledge was acquired regarding the necessary procedures for such research.

5. A General Yoga Therapy Survey began in September to examine and ascertain effects of yoga on various disorders. Questionnaires are now being filled out at the beginning and end of yoga courses. Follow-up questionnaires are to be sent in every three months. Data will be analyzed in due course, and reported in this journal

YRF Case Reports

10.6.89

Respected Swamiji,

I attended your ten day camp on 'Asthma and Yogasana' at Barsi and I have become alright due to your guidance and am feeling optimistic. I have developed the faith that I can live a little longer.

For the last ten years I have been taking many types of medicines without any noticeable benefit, but the solution came in those ten days. Actually, I was on artificial oxygen as per a doctor's advice from 25th May '88 to May '89. Until the yoga asthma study course, I was taking oxygen for 6 to 8 hours daily. Since those fifteen days of practising yogasanas under your guidance, I have managed to go without the oxygen. Due to your blessings I can live longer and better.

I will keep regularly practising the asanas you have given and also I will recommend yoga to others. After your ten days of sympathetic guidance and company I have found new meaning in life and increased enthusiasm for life. I do not know how to repay the good that you have done me through yoga. I will live by the knowledge that you have given and try to share it with others. I pray my endeavours will be successful through your blessings.

Your Kripabhilashi
Mrs K.K

(Names of subjects are confidential)

YRF Case Reports

9.6.89

To Sri Swamiji,

As you prescribed, I have been practising asanas and pranayama from 3.6.89 to 8.6.89. I will talk about the benefits that I have experienced below:

I was a serious patient of asthma during your course. Since the period mentioned above, I have experienced 50% satisfaction due to the practice. I cannot say whether the benefit is due to asana or the medicines, because my medical treatment is going on simultaneously.

I cannot perform all the prescribed asanas because I am too weak, and due to weakness I do not have control over my body. During the asanas, I experience cough and shivering of the body, a sort of electric shock or sometimes the loss of sensation due to stopped blood circulation. Sometimes during the practice I experience strain on my veins (nadis) and subsequent stiffness and slight pain. Even so, except for surya namaskara and no. 4 asana of hatha yoga, I have been practising all the asanas.

For stomach cleaning I could not do laghoo shankha-prakshalana or kunjla due to weakness. Even so, I feel satisfaction because I have been doing some of the prescribed asanas pretty well. I have experienced satisfaction from pranayama and dhyana. This makes me hopeful of recovering soon.

With your blessings I will recover totally within six months time.

Yours faithfully,
NDN

(Names of subjects are confidential)

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Editorial

Swami Niranjanananda Saraswati

From a satsang given at the 2nd International Doctors' Symposium, Ganga Darshan, January 1990, on the yogic psychophysiology of disease.

The concept of health from the yogic viewpoint is not only confined to the physical aspect but to each and every strata of our personality. The United Nations has defined health as being physical, mental, spiritual and social. Well, this theory is not the property of the United Nations. It belongs to the United Individual and the basis is commonsense. This is exactly what yoga has been proposing for many hundreds and thousands of years.

There seems to be a lack of understanding of our own personalities in every kind of 'pathy'. If you look at allopathy, does it actually treat an illness or disease, or does it only treat the symptoms which manifest in the body or the mind? I feel that rather than being able to really cure an ailment, allopaths themselves are unable to fully understand the integration of body, mind, environment, emotion and spirit in an individual. A similar analysis can be made of other 'pathies' as well, though there are some which recognize the psychological factors behind an ailment or disease, or the pranic imbalance which causes an ailment or disease. The concept of total health has been a continued feeling of people who have been aware and not of those people who have simply tried to misuse and over use the equipment of this instrument provided by God.

Indulgence, disease and imbalance

This concept has been clearly defined in yoga as bhoga, roga and yoga. *Bhoga* does not refer to the pleasures that we seek, but to the states of fulfilment, contentment, satisfaction and enjoyment within the body, mind, emotions, spirit and society. When these states are imbalanced, then *roga*, disease, will

manifest. The effort which seeks to bring about the balance is then known as yoga. Looking at health and disease from this angle brings fresh insight.

Why do we get stomach problems, indigestion, diarrhoea, dysentery, gas, bile, hyperacidity? Because there is an imbalance in our diet and we do not follow the natural pattern, the natural biorhythms of the body. This mistake is creating more and more imbalances within our system which have to manifest in one way or another. So the whole concept of therapy in yoga revolves around the removal of imbalances and blocks.

Somebody may be suffering from a physical ailment and that is definitely going to have a foundation in the mental and emotional structure and this affects the normal and natural performance of the internal organs. The body behaves and performs in a particular pattern over which there is no voluntary control. Digestion happens automatically, spontaneously, we cannot control our digestion. We cannot control the secretion of fluids, we cannot even control our heartbeat. We can simply control the external activity. The involuntary actions, the autonomic activity continuously happening within us is, however, subject to stress and tension, misuse and overuse.

There is another concept in yoga which defines the cause of human problems. Four things are the cause of many ailments: imbalance in *ahara*, diet; imbalance in *nidra*, sleep; imbalance in *bhaya*, fear, phobia or any kind of suppression or anxiety; and imbalance in *maithuna*, sex, so one does not get sensual or sexual satisfaction. These states are bound to create more psychological problems, which will then reflect on the body. These various factors which eventually cause a disease all have to be considered and monitored according to the yogic philosophy.

The practices provided in yoga place equal emphasis on physical exercises as well as on the techniques of relaxation, concentration and pranayama which help in increasing the level of vitality, stamina and strength within the personality. The practices selected in a yoga program lead to the gradual release of blocks from the pranic structure, or pranamaya

kosha, but they also go further than that. Yoga believes that there IS a difference between the emotional, pranic and mental influences and provides techniques for dealing with them.

Three types of lifestyle

Now we know that there are three types of people who have been defined as the *sattwic*, balanced, the *rajasic*, dynamic, or the *tamasic*, dull. These three types represent a style of life more than a person. or an individual. It is noticeable that sattwic people will not suffer from any kind of illness or disease. They might get an occasional cough, cold or fever, an occasional body ache or headache but they are not going to suffer any more than this. They will never come down with jaundice, hepatitis or TB, no matter in what environment or in what condition they live because the sattwic lifestyle simply represents a lifestyle which is balanced and integrated. This would also reflect on behaviour, the thinking pattern, the emotional pattern, on diet and on the states of mind.

Rajasic people are prone to be sick; tamasic people are prone to suffer all their life, because the tamasic personality represents not just imbalance, but chronic imbalance. So yoga therapy recognizes that there are only two kinds of people who are suffering: the rajasic and the tamasic. Therefore, yoga approaches the individual according to the type of personality. How that is done is very much between the student and the teacher and the ability of the teacher to recognize the need, the condition and the state of the student.

Emotional sensitivity

What of the behaviour of mind and the behaviour of emotion? We can easily define everything in terms of family pressure, work pressure or dissatisfaction with the family and social structure. We have our ambitions, needs and weaknesses, feelings of insecurity, of not being able to face certain situations in life. Generally we understand the whole thing as creating pressures, suppressions and anxieties in our mental and emotional structure. But a disease is not monitored by the level

of anxiety, frustration or euphoria that is being created. Rather we have to see the mental and emotional sensitivity of the individual because maybe in the same situation people who are less sensitive will respond differently. Here our outlook, our perception and our sensitivity is also involved.

Depression, anxiety, likes and dislikes on the emotional level can cause illness, physiological diseases. Work pressure or family pressure, worrying about the education of the children or the completion of a job, can cause high levels of stress and anxiety which can produce illness, headache, watering of the eyes, palpitations of the heart, high blood pressure, different kinds of diseases. We take a pill to remove the headache, but the worry is still constant in the mind. We have eliminated the flashing red light that is indicative of the malfunction in the instrument, but we have not corrected the actual malfunction. So even our approach towards therapy is very much symptomatic, physical and external.

So, the work environment cannot be the cause of a problem, a disease. It is our approach, our outlook, our reaction which may become the problem. Family pressures are there in every family in one way or another, as is the drive to fulfil our ambitions and satisfy our needs. The response of the rajasic mind and the response of the tamasic mind is different in such conditions; by monitoring the rajasic state or the tamasic state of mind and its sensitivity, we are able to judge how far the ailment has altered, influenced or affected the body.

We need to differentiate between the experience of the body, the mind, the emotions and the sensitivity. At the same time, we cannot neglect our ambitions and needs and become full-time yogis in order to enjoy optimum health. We can, however, make an effort as a yoga teacher, as a therapist, to understand a disease or a problem from a different point of view. A student is not a guinea pig on whom we test this chemical or that chemical, this yoga or that yoga. There has to be an understanding of the total structure of the individual before a therapy can really become effective. There has to be an understanding of whether the person is rajasic or tamasic,

and on that basis you try to correct the lifestyle, along with the necessary assistance that you might provide in the form of a pill or yoga program.

Holistic approach

Some emphasis has to be placed on correcting the lifestyle so that people are able to feel more harmonious, more balanced and integrated within themselves. Many people have been helped through yoga, like Dr Swami Shankardevananda, author of *Yogic Management of Asthma and Diabetes*, whose inner realizations through yogic sadhana sparked the turning point in his asthma. Very few therapies can provide that.

Gradually, as we become more aware of the difficulties in treating a disease and the patient, we will try to have a more holistic approach in future. Even now, during this Symposium, the whole discussion has been on the enlargement of the bronchial tubes. "Take this bronchodilator, it will enlarge the tubes so that you can breathe more." It is a very physical concept. We are living at a time when we need those physical parameters to motivate us but we have to utilize that knowledge in the projection of our ideas. Once we become involved, then the changes will happen in our perception and in our understanding which will make us our own therapists. Then we will not have to rely on spirometry tests or bronchodilators, but on our own judgement and commonsense of what is right for our health. To rise beyond the physical parameters we need to fully understand them first. After we have understood in total, we can try to pick up another area.

The ideal or correct concept of any therapy should parallel the concept of health which has been defined as physical, mental, emotional, social and spiritual. The concept of therapy should be the same as the concept of health. It is not a problem; it is something which we will realize after a few generations because right now we are in the process of investigating yoga by experimenting with the different ideas and techniques that science is discovering every day.

The YRF Yoga Asthma Study Pilot Project

Swami Gyansagar Saraswati

ABSTRACT: *The preliminary pilot year of the five-year Yoga Asthma Study has been completed. The long-term aim of the study is to observe the effects of yoga on the management of asthma. The aim of the pilot year was to trial the protocol devised for the study, consisting of Initial Patient Questionnaire (IPQ), diagnostic procedures, spirometry testing, yoga program, compliance anomalies, data collection and collation and follow-up procedures. In a review made at the close of the pilot year (Part A), presented at the 2nd International Doctors' Symposium, Ganga Darshan (January 1990), modifications were introduced to further improve the feasibility of the protocol, which are reported below (Part B). Statistics were also compiled to observe the make-up and behaviour of subjects in the pilot study (Part C).*

PART A: METHODOLOGY OF THE PILOT PROJECT

1. Diagnostic procedures

The original YRF protocol for the Yoga Asthma Study, devised and finalized at the 1st International Doctors' Symposium, Ganga Darshan, February 1989, was put into action from that date. Seven Yoga Asthma Study camps and courses were held during the year, four at Ganga Darshan and three at other locations around India. Emphasis was on recruiting as many subjects as possible. Subjects at Ganga Darshan were drawn from the regular ashram Yoga Health Management Courses.

IPQ, PE, Spirometry: On the first day of each course or camp, prospective subjects were administered the 137 question Initial Patient Questionnaire (IPQ), taking 1½ to 2 hours per person. A physical examination by a qualified medical practitioner who filled out the Physical Examination

Questionnaire followed (20–30 minutes). Then the subject was given a spirometry test (15 mins to 1/2 hour) with a Minato As 600 Spirometer. When course numbers were large, the testing procedures ran over several days. Emphasis was on completing the testing so as to begin the yoga course which was seen as comprising the body of the study.

Diagnostic evidence: Students had been requested to bring certain diagnostic data with them: a doctor's certificate ascertaining asthma with no complicating or infectious diseases; an ESR blood test and chest X-ray. Students were accepted as subjects when the tests proved they were definitely bronchial asthmatics with no complications, as defined in the protocol. Ashram staff carried out the spirometry tests and IPQs assisted by volunteer paramedics and doctors where possible. Volunteer doctors performed the physical examinations and completed the Physical Examination Questionnaire.

2. Yoga course

On completion of the diagnostic procedures (1–3 days), the yoga course began, running over the remaining days (7 days at the 10-day outside camps and 11 days at the two week Ganga Darshan Yoga Health Management Course). Students were taught asanas (postures) and pranayama (breathing) conducive to asthmatics, in the morning (1½ hours), and in the afternoon, yoga nidra (deep relaxation) and ajapa japa (simple meditation practice) followed for one hour. At the Ganga Darshan course they joined in the ashram kirtan (devotional singing). Halfway through the course the hatha yoga shatkarmas (cleansing practices) were taught. It was left to the student to perform these later at his/her own discretion. During the course lectures were given on the relation of yoga and asthma and the general physiology of asthma.

On the last day, a short Post-Course Questionnaire was filled in, a spirometry test given and a personally-tailored yoga program devised for each student. The data for the

study was explained and the subjects shown how to fill in the Daily Record Charts (DRCs) which record the subject's symptoms and yoga practice on a daily basis, to be returned to the YRF monthly, for 6 months, and the Monthly Evaluation Questionnaire (MEQ), recording the subject's subjective state, filled in by the subject's local doctor, a Regional Health Coordinator (RHC) or the subject, where applicable.

Accommodation and meals: Students lived in simple ashram style accommodation at the Ganga Darshan course and partook of the simple vegetarian diet, relaxed lifestyle and environment of the ashram, away from family and work tensions. At the outside camps, subjects continued with their normal lifestyle and environment, travelling to the camp location for tests and classes before and after work.

Follow-up

After 6 months, subjects were asked to return to the ashram, or if outside, to a brief follow-up camp for collection of follow-up data, consisting of a Follow-up Questionnaire and spirometry test.

PART B: SUBSEQUENT CHANGES IN METHODOLOGY RESULTING FROM THE PILOT YEAR

Certain changes have now been made to the protocol in the key diagnostic areas of:

1. Initial Patient Questionnaire (IPQ)
2. Physical Examination Questionnaire (PE)
3. Diagnostic evidence
4. Spirometry
5. Regular subject data (DRC, MEQ)

IPQ & PE

The pilot study's IPQ was lengthy in the interests of being comprehensive. However, it was found that the quality of answers suffered as subjects tired towards the end of the

interview. Therefore, the questionnaire has been streamlined. Some questions needed to be asked in different ways, e.g., questions relating to the Indian family context. The doctor is the best person to ask such questions, not just because of his/her expertise in this area but also for the purpose of establishing the necessary rapport with the patient. As a result, the IPQ and PE have been combined into the 'Initial Subject Questionnaire' (ISQ) to be filled in by the doctor.

Diagnostic evidence

In addition to the evidence already cited, prospective subjects are now also required to bring additional items in the interests of strict and thorough diagnosis: TLC/DLC and hemoglobin additionally to the ESR blood count, a stool test to discount eosinophilia and lateral chest X-rays. Urine tests will be performed by YRF staff to check glucose levels. Ganga Darshan hopes to set up its own pathology laboratory in the future to deal with the growing medical demands of the ashram's extended activities of which the YRF is one.

Spirometry

The latest information on spirometry methods, regarding operation and subject training, has led YRF staff to place even greater emphasis on spirometry in the Yoga Asthma Study.¹ Dr Swami Karmananda who is leading the Yoga Asthma Study in Melbourne, Australia, reported on a recent doctors' spirometry training course he had attended, and he introduced the ventolin challenge with pre and post spirometry testing at the last two camps/courses of the pilot year. Ventolin challenge is being continued in the study proper. Spirometry authorities now stress the necessity of training subjects prior to acquiring spirometric data. Therefore, training days for spirometry have been introduced into the YRF Yoga Asthma Study course program. The spirometry segment of the course and actual testing time has been lengthened. In fact the entire diagnostic segment of the course has been extended with extra days in

the beginning to ascertain adequate set-up facilities which ensure the smooth running of the program. The camps/ courses will now run over 20 days.

TABLE 1. SCHEDULE FOR YOGA ASTHMA STUDY CAMP

DAY 1	Arrival
DAY 2	Set-up day Meetings with organizers, doctors, volunteers; check facilities
DAY 3	Set-up day continued. Inauguration pm: form groups (5–7 people) and give testing times
DAY 4	Questionnaires and training <i>Group A</i> – Morning: ISQ (questionnaire and PE) <i>Group B</i> – Afternoon: ISQ <i>Group A</i> – Afternoon: Spirometry training
DAY 5	<i>Group B</i> – Morning: Spirometry training <i>Group C</i> – Morning: ISQ <i>Group D</i> – Afternoon: ISQ <i>Group C</i> – Afternoon: Spirometry training
DAY 6	<i>Group D</i> – Morning: Spirometry training <i>Group E</i> – Morning: ISQ <i>Group E</i> – Afternoon: Spirometry training
DAY 7	Spirometry testing Group A,B and part of C, staggered throughout the day
DAY 8	Remaining groups C, D and E Evening: Yoga Course inauguration
DAYS 9–18	Yoga Course
DAYS 19–20	Final spirometry tests

Yoga Course

No changes need to be made to the yoga program as such. However, course size will be restricted to 25 participants maximum to allow personal attention for each student.

Post-Course

Post-course spirometry (days 19–20) has been extended to allow 30–45 minutes testing time per person.

Follow-up

Six monthly Follow-up has been modified to include a lengthier revision of the yoga practices as well as the procedures already outlined.

Subject data

Daily Record Charts (DRC): Subjects will still fill out the DRC every day for six months. Thereafter, charts are to be filled in every three months (the 9th and 12th month) instead of a further full six months. Scientific method accepts this practice as an adequate sampling strategy.

Monthly Evaluation Questionnaire (MEQ): The MEQ has been discontinued as it is considered too subjective. Peak Flow Meter variability mapping will be introduced to observe monthly progress when the PFMs become available. As the PFMs are costly, the devices will be rotated amongst the subjects by the Regional Health Coordinator.

The Regional Health Coordinator

The RHC will closely follow-up the subject's participation, giving regular classes or functions where possible and collecting data to be sent later to YRF Headquarters. The RHC's role is to encourage subjects' compliance to the program.

PART C: SUBJECT ANALYSIS

A total 143 subjects (including 24 controls) were registered in the YRF Yoga Asthma Study during the pilot year (68% male, 32% female). The following demographic and descriptive statistics detail the pilot group. Analysis is made for the internal interests of the study, with the aim of detecting strengths and weaknesses in the methodology

(questionnaires, spirometry, etc.). The findings apply only to the pilot group and do not necessarily anticipate the make-up of the study proper nor should they be taken as representative of India as a whole.

Age	% subjects
Over 55	 17
45-55	 17
35-45	 29
25-35	 23
15-25	 11
0-15	 2

(1% spoiled answers)

Fig. 1. Age distribution of subjects

All students over 18 years were accepted in the pilot study. However, as the under 25 (13%) age group may be expected to improve with maturity, and the over 55 (17%) age group have usually an irreversible lung function, the actual study will be restricted to subject data in the 25–55 years age group, represented by 69% in the pilot study.

Duration of asthmatic condition

Statistics in this category showed that three-quarters of the subjects suffered for less than 16 years. Better results can be expected from this group than from those who have suffered for a longer time.

Seasonal pattern

Most subjects came from Northern India which has a climatic pattern of cool to cold winters, hot dry summers and monsoon. The graph below (Fig. 2) clearly shows the winter incidence of asthma (November–January), with a smaller group suffering during monsoon (July–September).

	<i>% subjects</i>
<i>Jan</i>	 39
<i>Feb</i>	 25
<i>Mar</i>	 13
<i>Apr</i>	... 9
<i>May</i>	... 9
<i>Jun</i>	 15
<i>Jul</i>	 23
<i>Aug</i>	 23
<i>Sep</i>	 22
<i>Oct</i>	 31
<i>Nov</i>	 46
<i>Dec</i>	 45

(9% suffer at all times
7% no seasonal pattern)

Fig. 2. Seasonal pattern of asthma attacks

Precipitants

Statistics from this category showed 85% of subjects suffering from sensitivity to dust, 66% to smoke. Working conditions presented a dusty environment to 43% while 11% work in polluted conditions.

Heredity

37% of subjects had a parent with asthma and 29% a grandparent with asthma.

Symptoms

When asked about their main symptom, 48% of subjects answered breathlessness, 26% wheeze, 18% cough and a combination of breathlessness and wheeze. In the breathless category, 22% suffered daily, 21% weekly, and others less frequently.

Duration of breathlessness and wheeze

<i>Duration</i>	<i>% subjects</i>
<i>Constant</i>	 10
<i>Over 24 hours</i>	 14
<i>Under 24 hours</i>	 12
<i>12 hours</i>	 5
<i>1-6 hours</i>	28
<i>0-1/2 hour</i>	28

(3% spoiled answers)

Fig. 3. Duration of breathlessness and wheeze

The graph for duration of breathlessness and wheeze shows as many people suffering up to six hours as for the first half hour (28% each). A group of 36% were very poorly controlled on drugs, suffering for one day and more. These figures for India are an interesting contrast to the West where asthmatics are well controlled on drugs, few suffering over one hour.

Hospital visits

Attendance at hospital is another interesting point of difference with a Western population regarding medical facilities and attitudes. Figures from the Indian pilot study show 70% of subjects never having visited a hospital, and only 10% having visited a hospital three times or more.

Daily pattern of wheeze when it occurs

<i>Wheeze</i>	<i>% subjects</i>
<i>All day and night</i>	 16
<i>Morning only</i>	 8
<i>Night and morning</i>	 19
<i>Night only</i>	38
<i>Never</i>	... 7

Fig. 4. Daily pattern of wheeze when it occurs

Over half the subjects suffered from wheeze at night and/or in the early morning hours (38% night; 16% night and morning). During the day when the body is active and the mind is directed outwardly, the symptoms subsided. This occurrence reinforces the theory that in some cases asthma may be linked with deep-rooted mental and psychological imbalances, that find expression during quieter, more introverted times.

Types of asthma treatment

		% subjects
Allopathic medicine	Past	 74
	Present	***** 76
Homeopathy	Past	 40
	Present	**** 9
Ayurveda	Past	 27
	Present	**** 11
Yoga	Past	 13
	Present	*** 3
Other	Past	 16
	Present	*** 3

Fig. 5. Types of asthma treatment

Three-quarters of subjects were presently controlled by allopathic medicine, with bronchodilators used by 81% and steroids by 40%. As has been reported in other yoga asthma studies, medication can be expected to reduce by two-thirds or half after yoga practice. Previous yoga practitioners amounted to 13% with only 3% continuing. For yoga to be effective, however, it must be a) practised regularly and b) be taught by an experienced yoga therapist with a thorough knowledge of the appropriate techniques for asthma, which was most probably not the case in the subjects' prior experience. In the case of yoga therapy, regular yoga practice constitutes compliance; the element of compliance is the

most important factor in the success of the Yoga Asthma Study.

CONCLUSION

A pilot study is an invaluable preparation for a major study such as YRF's Yoga Asthma Study. It serves to point out the weaknesses and strengths in the protocol and gauges to what extent the parameters of the study need to be extended or modified. From this one-year pilot study, the YRF has successfully been able to revise and refine subject data collation and the methodology of the Yoga Asthma Study.

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Yoga Therapy and Asthma

Dr Swami Shankardevananda Saraswati

An extract from a talk: 'Asthma: its diagnosis and treatment'.

Introduction

Dr Swami Shankardevananda Saraswati is an Australian physician and yogic researcher who studied for many years under Swami Satyananda Saraswati at the Bihar School of Yoga. In the course of his term at the ashram he was able to cure his asthma completely. A recent visit to the Dept. of Respiratory Medicine at NSW University astounded staff when a histamine challenge failed to activate his airways. In a lecture at the 2nd International Doctors' Symposium, Ganga Darshan, he discussed diagnosis and the positive aspects of asthma treatment from the medical viewpoint. In a further section of his talk he outlined the yogic therapy for asthma, which follows.

Definition

Asthma is a disease of the airways characterized by increased responsiveness to various stimuli. The result is widespread narrowing of the airways and the manifestations are paroxysms of breathlessness, cough and wheeze. Relief can come either spontaneously through therapy or by use of medications.

Medical therapy

The medical therapy of asthma is today very simple and effective. The aerosol sprays introduced over the past ten years have brought about this improvement. They deliver the drug straight into the lungs having an almost instantaneous effect. The amount of drug used is thereby reduced by about 4,000%. Drugs are now measured in micrograms, millionths of a gram, rather than milligrams, or thousandths of a gram.

Two types of sprays are used. Ventolin is an adrenergic stimulant, a bronchodilator that works very quickly in most

cases. Where bronchodilators reduce the spasm, steroids reduce the inflammation. Steroids have recently been introduced in sprays also. Another key drug is Intal which reduces the allergic reaction and enables people who wish to exercise to do so without an asthma attack. Theophylline is another asthma drug although people can get good relief by drinking black coffee, for caffeine itself is very potent.

Yoga therapy and asthma

The therapy for asthma using yoga involves four stages, or main groups of treatment. These are:

1. Asana
2. Pranayama
3. Hatha yoga shatkarmas
4. Meditation.

1. **Asana:** Asanas limber up the body and take away stiffness. A lot of asthmatics have stiffness in their chests. Asanas can also be used as a mild form of exercise. However, they have more powerful effects than this. They massage and directly influence the deeper organs. This is something we hope to be researching here in the future. In my research conducted in Australia over three to four years on pawanmuktasana, we found very specific effects. Pawanmuktasana circulates prana, helping to move the prana in the nadis when there are blockages. It also develops an awareness of the physical body: the most important term in the treatment of asthma and yoga is this word awareness. That awareness is the key to everything.

2. **Pranayama:** Pranayama is not breathing exercises but a method of generating prana. From the point of view of asthma, this is probably the most important aspect, for prana reduces inflammation. The basic underlying problem in asthma is inflammation of the lungs. Treatment is not just a matter of opening the lungs, it is a matter of getting rid of the inflammation. Prana generates vitality, and the more vitality you have, the more you can overcome and resist various stimuli and the more strength and stability you have

in your system. Vitality is a common word and everyone knows what energy is; we know when our vitality is low and when we feel good, but to research this, in a physiological sense, is another thing. As a person I can tell you, but as a scientist, I do not know what vitality is.

This is where yoga can offer the most help, because it understands prana. It helps us not only to generate prana but to conserve prana and to use it when and where we want to, with awareness and conscious control. Pranayama also develops respiratory muscles, and the more control you have over your muscles, the more control you can have over an attack so you will not panic, you will feel more confidence. Once the asthmatic has a basic grounding in asana and pranayama, we can go on to the shatkarmas.

3. Hatha yoga shatkarmas: The six kriyas of hatha yoga, the shatkarmas, are a powerful and often underestimated tool. These kriyas cleanse mucus from the body and also have potent effects on deeper levels of the human personality. The shatkarmas remove mucus from the nose in the practice of neti and from the stomach in the practice of kunjla which has a reflex effect on the lungs. There are many explanations for this principle in the oriental systems of healing. The cleansing process balances the doshas, known in ayurveda as vata, pitta and kapha (wind, bile and phlegm). Automatically you feel relief, you feel lighter, happier and stronger if it is done correctly. In terms of reducing inflammation in the short term, the shatkriyas are the most important practices; pranayama removes inflammation in the long term.

Shatkarmas also improve awareness of the inner cavities. In *vastra dhauti* you put a cloth into your stomach and churn it around, thereby becoming aware of the space within your body. Generally we do not feel inside ourselves, but when you are putting water or cloth inside the stomach, or somehow putting pressure in your body, then later on you feel more sensitive to the substances you put into the body. When you overeat you feel it more acutely. If you put

the wrong food or some poison into your body, you know it immediately as the sensitivity and the awareness of the internal body has improved. At the same time you gain control over the basal part of the brain, the animal brain. When you are learning to vomit (kunjali), or learning not to vomit (vastra dhauti), when you are learning to purge from your intestines, then you are descending into a level of the nervous system which is unconscious. At that part of the brain lies not just the control of the heart, the blood pressure and the lungs, but many of the psychic conflicts which are at the root of many illnesses. We start to probe very, very carefully into the deeper, psychic body of our personality. Gradually as the mucus comes out, so do a lot of these complexes. So, control over the nervous system is at three levels: physical, mental and psychic.

4. Meditation: The first three stages lead to meditation. Meditation affects the mental side of the personality as well as the emotional and psychic sides. Initially we learn to relax the psychic problems. We start with the mental problems, the overactive mind, thinking too much. When we want to go to sleep we are thinking; when we want to concentrate we cannot concentrate. This is the normal state for many people because of the pressure and stress of daily living. So initially, we relax those tensions through meditation and a balance comes. Once the relaxation takes place, we begin to strengthen and stabilize the mind.

Yogic treatment is not complete without yoga nidra, a deep relaxation practice which systematically relaxes on the four levels: physical, mental, emotional and psychic. The yogic practices serve to expand our awareness, giving insight into the cause and the effect. As your awareness develops you can see what is causing the asthma. Then you become your own doctor, your own healer.

Ongoing therapy

It is important to be aware of the dangers inherent in stopping drug therapy suddenly.

1. Stopping drug therapy will lead to deterioration of the asthmatic state and prevent patients from either learning yoga or practising regularly and consistently.
2. A negative and inappropriate attitude to medication leading to hesitancy in using drug therapy when required might lead to death. This especially applies to the excessive use of bronchodilators and insufficient use of steroid aerosols. In everyday management, modern aerosol medication and education programs using peak flow meters have reduced the dangers which previously gave drugs a bad reputation. They have also improved the quality of life for many asthmatics.

A patient using yoga for asthma therapy should be encouraged to slowly taper off medication and gradually replace them with yogic techniques, but only under the advice of their physician. It is one thing to learn a technique and another to be able to apply it effectively.

Preliminary Report on the Yoga Asthma Study in Victoria Australia

Dr Swami Karmananda Saraswati

ABSTRACT: Melbourne Yoga Therapy Centre (MYTC), Australia, conducted a YRF Yoga Asthma Study pilot project for six months, concurrently with YRF Munger (India). Eleven subjects were given the standard YRF diagnostic tests (as described in the protocol) and a weekly yoga class of practices conforming to YRF standardization. The majority of subjects showed some improvement in their condition. Significant improvement was hampered by the inclusion of elderly subjects. Excellent experience was acquired for conducting the five-year Yoga Asthma Study clinical trial. Conclusions from the pilot study point to a longer time needed to assess progress, and to tightening of the selection criteria for subjects.

Aim

The Melbourne Yoga Therapy Centre seeks to evaluate whether yoga practices have a significant role in the management of asthma in Australia.

Asthma in Australia

Asthma is particularly prevalent in Australia, which has the world's second highest mortality rate after New Zealand. An estimated 1 in 5 Australian children will develop symptoms at some stage in childhood. The rise in incidence and mortality from the disease is alarming health authorities who now place a lot of emphasis and funds on patient education programs. These management programs principally involve medication, but also emphasize the lifestyle factors of diet and exercise.

Method

After the first International Doctors' Symposium on Yoga and Respiratory Diseases at Ganga Darshan in January 1989,

which finalized the protocol for the Yoga Asthma Study, Dr Swami Karmananda and Swami Muktibodhananda Saraswati commenced a pilot study at the Melbourne Yoga Therapy Centre to run concurrently with the Yoga Asthma Study in India.

Eleven asthmatics ranging from mild to severe were enrolled in the pilot study. Selection criteria for the subjects were as broad as possible, with three subjects being 60 years old and one other a moderately heavy smoker. Protocol, proformas and the standard YRF data collecting material (Initial Patient Questionnaire, Physical Examination Questionnaire, Daily Record Charts, Monthly Evaluation Questionnaire – see protocol) were used. The pilot study was designed to run over six months, until November 1989 when the data could be taken to YRF, Munger, for evaluation and analysis. Subjects in the pilot study then had the option of being ongoing subjects in the five-year study.

Yoga course

Yoga practices as per the YRF protocol were taught one morning per week at the Melbourne Yoga Therapy Centre, Clifton Hill, by an experienced yoga teacher. MYTC was unable to hold a residential training camp during the pilot study. The teaching differed from the Indian study in that the practices were taught during the weekly classes rather than in an intensive block at the beginning.

Spirometric assessment

Comprehensive lung function tests were performed on a PONY computerized spirometer at the MYTC at the start of the yoga course. Follow-up tests were performed at 3 and 6 months to assess progress. (Discussed below)

Preliminary problems

Preliminary analysis of data suggests the following:

Age – Elderly subjects whose condition is well entrenched were slow to respond to yoga. They were also hampered

by other health problems such as arthritis, and were usually well stabilized on their medication. The pilot study included two men over 65 years and one woman of 74 years. Significant clinical response is not likely from them. They all experienced difficulties with some of the practices in class and suffered flare-ups of arthritis after several months of yoga, although their lung function improved marginally. Medication remained constant. From this experience, only subjects under 55 years, free of complicating problems such as arthritis, hypertension, heart disease and diabetes will be accepted for the study proper.

Smoker – Asthmatics who are also smokers should not be included in the study. Smoking is an aggravating factor in all respiratory conditions, including asthma. The initial patient history needs to be adjusted to gain more information on smoking habits.

Compliance – It soon became clear that some subjects were practising yoga regularly and others were not. In future, the subject data will be divided into two groups according to frequency and regularity of practice.

Follow-up – The workload involved in contacting subjects for classes, checking daily record charts and monthly examination data was very demanding, even for such a small number of subjects. But without this constant effort and encouragement, the proper records and serial data to perform the clinical trial will not accumulate. Many scientific studies falter at this point in their protocol. Much time and effort needs to go into encouragement and compliance which is even more difficult with control subjects, especially in a trial over several years.

Preliminary data analysis

‘Cure’ of asthma can be entertained only in the scope of a long-term study. Many subjects improve seasonally, or in response to other variables, but relapse later on. The MYTC pilot study figures reinforce the need to continue for a much longer period to assess improvement in condition.

Progress is evaluated in the Study by the following range of parameters:

Improved symptomatology – After several months, the symptom pattern of a subject emerged clearly from the Daily Record Charts. It was simple to assess whether frequency and severity of attacks was diminishing.

Periodic spirometry assessment – Subjects underwent regular follow-up spirometry tests to record lung function values for later comparison.

Medication requirements – Significant decreases in medication requirements were noted in several of the subjects, in conjunction with clinical and spirometric improvement. Longer term maintenance medication were not altered at this early stage. Medication remains the primary responsibility of the subject's physician through consultation on a monthly basis.

Peak expiratory flow rates – The Study calls for peak flow readings to be recorded on the Wright Mini Peak Flow Meter twice a day, before medication is taken. These values fluctuate greatly or minimally between morning and evening and from day to day, according to the patient's condition. Interpretation of these values has been outlined in the current treatment plan issued by the Australasian Thoracic Society (*Med. J. of Australia*, Dec-Jan, 1989-90). The PEF figures may be evaluated as follows over a given period of preferably 14 days:

$$\frac{\text{PEF (highest)} - (\text{lowest}) \times 100}{\text{PEF (highest)} \quad 1}$$

This yields a percentage value, termed the *variance*. The higher this percentage value, the greater the variability or instability of the subject's asthma. Likewise, the lower the percentage value the less variable or more stable the condition.

Results

Early analysis from the pilot study subjects showed the following results:

- 18% of subjects showed highly significant improvement on all parameters.
- 36% of subjects showed no significant improvement in their condition.
- 54% of subjects showed some improvement in their condition. The significance of these improvements cannot be determined at this stage. This clinical and spirometric data has been added to the data base at YRF headquarters in Munger. The full data from the MYTC pilot study will be published along with the YRF (India) data from the pilot study.

Conclusion

This small initial pilot study over 6 months at the MYTC has helped MYTC researchers appreciate the many difficulties to be faced in conducting the five-year clinical trial on yoga and asthma. A longer time period than 6 months is necessary for observing improvement in subjects. Selection criteria of subjects, regarding age and smoking habits, will be stricter in the actual five-year Yoga Asthma Study.

Yoga Research Foundation: Yoga Asthma Study Protocol-90

I am confident that the Yoga Research Foundation will provide a scientific interpretation of the practices of yoga.

—Satyananda Paramahansa

The Bihar School of Yoga and the Yoga Research Foundation

The Bihar School of Yoga (BSY) was established in 1964 by Swami Satyananda Saraswati as a residential centre for systematic yoga training. In the course of time due to the reputation of BSY as a healing centre, people started to arrive from all parts of India and abroad for relief from their physical and psychological ailments.

In order to explain the yogic healing process in terms acceptable to the international medical community, Swami Satyananda established the Yoga Research Foundation (YRF) 20 years later, in 1984. The newly constructed Research Centre at Ganga Darshan has been handed over by BSY to the YRF to further its aims and objectives.

The YRF aims to conduct various research projects and to train health professionals and other interested persons in the correct use of yoga therapy. Before establishing its own network of Therapy, Research and Education Centres, YRF will rely on the expertise and experience of BSY, its teachers and affiliated centres.

A number of reports have been published indicating the effectiveness of yoga in the treatment of asthma, for example those by the Vivekananda Kendra Yoga Therapy and Research Centre in Bangalore and other Indian studies¹⁻⁵ and outside India by M.K. Tandon in Western Australia and J.R.M. Goyeche in Japan.⁶⁻⁷ The YRF intends to further this research as few long-term studies on the beneficial management of asthma through yogic practices have been undertaken.

Hence, the first research study of the YRF is the Effects of Yoga on Bronchial Asthma, to be conducted over a five-year period. The one-year pilot study was completed during 1989.

This Protocol-90 has been produced after analysis of results obtained from the pilot year. It is important that this Study conforms to the design set out in this document. No changes should be made to the Protocol without the authorization of the Advisory Board and participants at the annual Doctors' Symposium at Ganga Darshan, Munger.

Advisory Board

Swami Niranjanananda Saraswati, Chief Patron

Dr P.N. Jha, MRCP

Dr Swami Aparnananda Saraswati, MBBS, Chief Medical Officer, Goenka Matri Sadan Hospital

Dr Swami Karmananda Saraswati, MBBS

Dr Swami Shankardevananda Saraswati, MBBS

Swami Omananda Saraswati, BA, LLB

Dr R.C. Varma, FRCS, Vice President Indian Association of Orthopaedic Surgeons

Dr A. Prasad, MBBS

Dr Swami Mangalteertham Saraswati (Dr A.K. Ghosh), MSc PhD

Yoga Research Foundation

Swami Sambuddhananda Saraswati (Chief Co-ordinator)

Swami Gyansagar Saraswati (Data Management)

Swami Jyotirupananda Saraswati (Spirometry)

Swami Shaktimudrananda Saraswati (Research Collation)

Regional Health Coordinators

Doctors and yoga teachers interested in yoga research who can give some time in following up subjects in their area can participate as Regional Health Coordinators (RHCs). Their duties include checking Subjects' Progress and Daily Record Charts, recording Peak Flow readings and

organizing yoga classes or functions to motivate the subjects. The charts are to be sent to the YRF regularly. A Regional Health Coordinating Committee can be formed to share the workload.

RHCs who satisfy the required degree of precision and commitment for the full duration of the Study will receive accreditation in the final published report. They will also receive an 'Asthma Yoga Teaching Accreditation Certificate' personally from the Chief Patron of the Yoga Research Foundation which will enable them to establish Yoga Asthma Therapy Courses utilizing the practices of the Bihar School of Yoga.

Aim

We aim to investigate whether regular long-term practice of Integral Yoga will be beneficial in the management of asthma and improve:

- a) Asthma symptoms
- b) Asthma control
- c) Lung function in asthmatics
- d) Severity of asthma
- e) Asthma disability and incapacity.

Questionnaire administration

Doctors will administer the 'Initial Subject Questionnaire' and 'Six-monthly Follow-up Questionnaire'. Each subject will give informed consent (a consent form in Hindi and English is part of the initial questionnaire).

Medical physical examination

Purpose of the examination:

- a) To diagnose bronchial asthma
- b) To exclude conditions such as TB, diabetes and any infectious or complicating diseases
- c) To allocate subjects to different classes
- d) To alert teaching personnel to conditions that will require special attention .

Diagnostic testing

Patients must present at a Ganga Darshan Yoga Asthma Course or outside Asthma Camp a certificate from their local doctor stating that they have bronchial asthma and no other infectious or complicating diseases plus the following X-rays and tests obtained within the previous two weeks:

- a) PA and lateral chest X-ray and report. (The films and reports will be returned upon conclusion of the diagnostic process.)
- b) Results of blood tests:
 - 1. TLC
 - 2. DLC
 - 3. Haemoglobin.
 - 4. ESR
- c) Routine microscopic stool test.

During the course or camp doctors may order other diagnostic tests as necessary.

Spirometric testing

For the purposes of diagnosis in this study the following criteria for asthma are used:

- a) FEV_1/FVC % less than 80 % predicted (provisional).
- b) 15 % reversibility in FEV_1 after aerosol bronchodilator.

Details of testing procedures and physiological basis of the tests are set out in the Spirometry Manual.

Data collection

All the relevant data will be entered, stored and analyzed by the YRF computing facilities at Ganga Darshan and later published in the form of medical and scientific papers of an international standard. The parameters to be investigated from this data will be:

- a) Number of episodes per week
- b) Duration of episodes
- c) Nature and severity of symptoms
- d) Medication requirements
- e) Lung function: VC; FVC; FEV_1 ; FEV_1/FVC %; FEF_{25-75} ; PEF.

All subjects' records will be kept confidential. Provision for computer data security and back-ups as well as hardware and software maintenance is assured.

‘Yoga’ and ‘Control’ groups

After satisfying the entry criteria, asthmatics with proven bronchial asthma and no other complicating disease, will be allocated to either a ‘Yoga’ or ‘Control’ group. Both groups will be given a physical examination and free spirometry test and will be requested to complete an Initial Subject Questionnaire. ‘Control’ groups will be asked to continue their usual medication while the ‘Yoga’ groups will continue their necessary medicine and receive yoga instruction as well. Subjects will self-select to either the ‘Yoga’ or ‘Control’ groups.

The ‘Yoga’ group may be further divided:

- a) Over 16 years and less than 55 years
- b) Over 55 years
- c) With arthritis
- d) With hypertension.

Both groups will be further divided for purposes of analysis:

- a) Courses at Ganga Darshan ashram
- b) Outside camps.

Yoga asthma courses and camps

There will be twenty-day Yoga Asthma Courses at YRF, Ganga Darshan, Munger, in specific months during the year.

Twenty-day outside Yoga Asthma Camps can be organized by interested RHCs, after contacting the YRF. Details of the requirements can be found in the Yoga Asthma Handbook, available from the YRF on request.

Yoga teaching

The principles of yogic management of asthma have been outlined by the Bihar School of Yoga and basically involve:

- a) increasing vitality

- b) improvement of physiological and psychological conditions through yoga asanas, pranayamas and philosophy
- c) reduction of anxiety and lack of confidence
- d) reduction of respiratory mucus through dietary manipulation and nasal and gastric lavage
- e) correction of postures which disadvantage respiratory muscles
- f) relaxation and strengthening of breathing muscles
- g) encouraging emotional release.

‘Control’ and ‘Yoga’ post-course spirometry and ‘Yoga’ questionnaire

At the conclusion of the course all subjects will repeat the spirometric testing. ‘Yoga’ group subjects will also complete the Post-Course Questionnaire.

Daily record charts

‘Yoga’ and ‘Control’ subjects will be instructed in the use of the Daily Record Chart. These will be filled in each day for the first six months and then during the 9th and the 12th month after the course. Completed charts should be delivered to the RHC. Further charts can be obtained from the YRF or RHC. The RHC should ensure that each chart has been completed correctly.

Peak flow chart

When Peak Flow Meters are available ‘Yoga’ and ‘Control’ subjects will be instructed in the use of the Peak Flow Chart. These will be filled out for one week each month over the initial six month period. Charts will be maintained by the RHC. Instructions in the use of the peak flow meter will be found in the YRF Yoga Asthma Study Handbook.

Forwarding of records to Yoga Research Foundation

Daily Record Charts and Peak Flow Charts will be collected and forwarded to the YRF by the RHCs.

Six-monthly follow-up camps

- a) Procedures and set-up will be similar to the initial course or camp but medical physical examination will not be performed.
- b) The RHC ensures that all subjects are informed well in advance and given whatever assistance is required for them to attend.
- c) The Six-Monthly Follow-Up Questionnaire will be administered by doctors.
- d) The 'Yoga' group will have their practices revised.
- e) Records will be collected by the RHC.

Care of subjects

All care and consideration will be given to subjects but the YRF does not have facilities to look after people who require constant nursing attention. Subjects must be well enough to participate fully in classes and course activities.

It is important that subjects bring correct and sufficient prescribed medication for the twenty-day course. No alterations to medication will be made by the researchers, with the exception of omitting early morning drugs (other than steroids) prior to the spirometry testing.

Medical practitioners will be in attendance while the subjects are examined and instructed in yoga. The overall management of subjects' asthma will be maintained by their usual medical practitioner.

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Book Review:

Yogic Management of Asthma and Diabetes

By Dr Swami Shankardevananda Saraswati, MBBS, under the guidance of Swami Satyananda Saraswati, Bihar School of Yoga, Munger, India, 1977; 4th enlarged edition, 1984.

“Yoga teaches us to change our attitude towards disease, to see it as a learning experience, and at the same time offers us the techniques by which we can not only remove disease, but also manipulate and cultivate our internal body processes so as to achieve higher states of awareness and fulfilment. In asthma, for example, it offers us techniques to relax spasmed muscles, induce bronchodilation, remove clogged mucus, rebalance the nervous system, allay anxiety and remove the root cause from the emotional and psychic body. In diabetes it lowers blood sugar and rebalances imbalanced natural and metabolic processes as well as helping us to become stronger, fitter and happier.”

Yogic management of asthma and diabetes

The BSY publication, *Yogic Management of Asthma and Diabetes*, examines these illnesses with an insight and expertise that makes the book indispensable reading for any sufferer, doctor or therapist. Written by Dr Swami Shankardevananda Saraswati the author's understanding of asthma is first hand. Through yoga, he completely cured his own chronic asthmatic condition. The personal account of his experience reported in the book stands as an insight into the psychological component of the disease which complements his medical and yogic knowledge.

The yogic section of the book is preceded by a thorough medical and scientific analysis of asthma, covering its cause, symptoms and medical treatment. The workings of the respiratory system are clearly explained in a separate chapter. Different approaches such as ayurveda, homeopathy,

biochemical salt treatment, speleotherapy and auto-urine therapy are also considered, along with other treatments such as coffee (known for its bronchodilating effect), herbs, massage and sauna.

Dr Swami Shankardevananda outlines the major drugs prescribed for asthma and emphasizes that discontinuation of medication is not recommended in the initial stages of yoga practice. But, as the yoga therapy becomes established and the patient's confidence and inner security increase, "he will need to resort to drugs less and less." Diet is another topic of consideration. The author instructs how fasting, overeating, constipation and digestion relate to the asthmatic or diabetic state. This discussion is also of interest to the general reader.

The doctor hints at the potential of yoga early in the book, when describing muscles. Of the two types of muscles in the body, skeletal muscles are voluntary, while smooth muscles, ordinarily, are involuntary. "Both types of muscle are found in the lungs," he writes. "During an attack the smooth muscle inside the bronchial tube contracts, permitting less air to pass. The skeletal muscle in the chest wall is also contracted because of panic arising at the onset of attack." Yoga is able to intervene in this natural response. "It is worth noting," remarks the author, "that through advanced yoga techniques one may voluntarily control the smooth muscle also."

Yogic treatment

The theme of voluntary control of normally involuntary processes is central to yoga therapy. At the same time, yogic logic is "based upon the internal readjustment of the physical organism through stimulation of the body's own regenerative processes." The yogic methods of readjustment and mastery are succinctly and briefly outlined in the first section of the book, focusing on i) practices to be used during an acute attack and ii) long-term practices to reduce further attacks. The next section presents these practices

in detail, concentrating on the cleansing practices, surya namaskara, pawanmuktasana, major asanas, pranayama, bandhas and meditation. Incorporated into the yoga nidra practice is a creative healing visualization for both asthmatics and diabetics. A novel addition is the combination of certain asana/pranayama tailored to improve lung function. For example, the asthmatic swings the arms through the straddled legs, emitting a ha-ha-ha sound on exhalation.

The author describes how one asana in particular brought about a major transformation in his disease. Achieving some skill in dhanurasana (the bow pose), he “felt a knot of energy unwind in the upper back and simultaneously and instantly my nostrils, which had been blocked, inflamed and continuously dripping mucus, for many years, cleared up.” Relief lasted some hours and with time, the effect became entrenched and the problem disappeared.

The third section of the book, on research, reports the Asthma and Diabetes Camps conducted by BSY and related institutions in the 1970s and 80s and some case histories which are testimonies to yoga’s effectiveness. A chapter entitled the ‘Holistic Approach’ traces input of key psychosomatic oriented researchers around the world who have been probing the genesis of asthma. Further chapters present a summary of major clinical trials conducted internationally on yoga and asthma/diabetes over the last twenty years. Physiotherapy too, during the 1950s, introduced some innovative techniques for asthmatics which closely resemble yoga practices.

A useful appendix closes the book with instructive diagrams of the internal organs, and location of the endocrine glands and chakras. A glossary of medical terms provides a ready reference for readers struggling with medical terminology. A substantial bibliography cites articles on asthma and diabetes published in specialist bio-medical journals.

One point of emphasis in the book is that ‘attitude’ is a crucial factor in the yogic management of disease. A

sincere and honest attitude towards improvement leads to development of the faculty of 'awareness' or attention to shifting physical, mental, and emotional states. Such detached awareness replaces the binding identification with the disease and its triggers, under which many patients suffer.

"Awareness and a positive attitude towards cure can transform your entire life," claims the author, from experience. "You will soon come to view situations as learning experiences rather than as annoyances. The overcoming of asthma is a big achievement and should be undertaken with cheerful optimism."

Report on the Second International Doctors' Symposium, Ganga Darshan, January 1990

The Yoga Research Foundation hosted the Second International Doctors' Symposium in January this year to review the completed one-year pilot of the Yoga Asthma Study. Doctors and health professionals from all over India and abroad converged at Ganga Darshan to consider the preliminary results and necessary changes to be made in the ongoing study. Demographic and statistical findings from the data collected so far were enumerated; problems of data collection and administration were discussed. Conclusions reached have led to the lengthening of the Yoga Asthma Study course from two weeks to twenty days, for the purpose of making the diagnostic tests, particularly spirometry, more thorough.

Chief patron of the YRF, Swami Niranjanananda, inspired all present with his deep understanding of the yogic psychophysiology of disease. Dr Swami Aparnananda summarized the year's activities and later, with Swami Omananda, reviewed certain findings leading to changes in the protocol. Chief coordinator of the study, Swami Sambuddhananda, spoke on the 'Practicalities of Teaching and Administration' in Yoga Asthma Study camps and courses. Dr Swami Shankardevananda from Australia communicated the findings from his research into yoga and respiratory muscles. Swami Jyotirupa discussed the intricacies of spirometry testing, while Swami Gyansagar presented a demographic overview of the data collected during the year. Swami Mangalteertham showed his fascinating slides of electrical brain mapping during yoga nidra, from his work at Charing Cross Medical School, Cambridge, UK.

YRF News

On 26th November 1989, a large YRF team, consisting of Doctors Swamis Karmananda and Satyasankalpa from Australia and Swamis Omkarananda, Sambuddhananda and Jyotirupa from Ganga Darshan, left Munger for a Yoga Asthma Camp at Raipur ashram. Dean of the Medical College, Raipur, Dr I.M. Shukla inaugurated the camp, with an address by Swami Shrikanandaji of the Vivekananda Ashram, Raipur. Many local doctors participated, including general practitioners and chest specialists, as well as doctors from Dallirajhara and Satna and students from the Raipur Ayurvedic College. Out of 116 asthmatics presenting for diagnosis and the initial tests, 49 met the criteria for Yoga subjects, with 25 accepted as Control subjects. The camp finished on 11th December and significant research data is expected from the well organized follow-up programs.

A Yoga Asthma Study Course took place at Ganga Darshan, Munger, from 16th to 30th December. From 13 candidates, 7 fitted the parameters of the study. A subject from a previous asthma course also participated as a refresher. Dr H.K. Ghosh (Karmayanam) from Australia and Dr Swami Aparnananda diagnosed the patients. Swami Jyotirupa operated the spirometer and Swamis Sambuddhananda, Chaitanyananda and Gurubhakti conducted the course.

Yoga Asthma Study courses, Ganga Darshan

The special Yoga Asthma Study courses for asthmatics fitting the criteria of the study will be held at Ganga Darshan in July and October, from 11th to 30th 1990. Outside camps will be organized where a Regional Health Coordinator can guarantee close regular follow-up. YRF extends an invitation to any interested doctors who might be able to spare a week or more of their time to be present at one of the Ganga Darshan Yoga Asthma Study courses.

YRF Correspondence

The following letter shows the type of problem confronting such a study at the YRF Yoga Asthma project when dealing with seriously ill subjects.

November 1989

Dear Sambuddhanandji,

No words of felicitation are enough to commemorate the memory of your kind treatment with affection to each of us. This has become my personal asset which I will never forget.

I have received two letters of yours but regret to let you know that I have become ill since the last two months. I am suffering from severe attacks of Pondish. Your coordinator (RHC) has come to my residence and seen my condition of health. As per doctor's advice, I am not able to move about for two months. From this you can easily understand how it will not be possible to go for a medical check-up (i.e. six-monthly follow-up) in the month of December.

Yours faithfully,
UP

Progress letter from a subject

Please find enclosed herewith the monthly evaluation chart for the month of October 1989.

There was a mild attack of asthma on 29th October 1989, due to excess inhalation of smoke which was controlled by yoga nidra for about 251 minutes after 10 minutes of attacks:

The illness in the month of August was due to exposure of rain. I also feel that I can inhale more air during pranayama in comparison to previous months.

Yours sincerely,
Bihar

(Names of subjects are confidential)

Asthmatics Yoga Research Foundation Yoga Asthma Study

Specialized Yoga Courses for Asthmatics willing to be part of an International Yoga Asthma Study conducted by the Yoga Research Foundation will be held at the Bihar School of Yoga, Ganga Darshan, Munger, Bihar, in the following months:

July and October, from 11th–30th, 1990

Participants must bring the following tests not to be more than two weeks old from the beginning of the course. *Full Blood Count: TLC/DLC, Haemoglobin and ESR, PA and Lateral Chest X-rays.* Also bring your medication, recent medical history and a doctor's certificate stating

'This is to certify that

(name) of

(address) has

been diagnosed as having bronchial asthma and no serious complicating or infectious disease. This patient has no/the following chronic illnesses.'

Signed

Fee Rs. 400/- including Rs. 50/- reservation fee, is payable by money order or bank draft to Yoga Research Foundation, Munger, A/C Payee only. Indian Postal Orders not accepted. On receipt of reservation fee, admission letter and details will be forwarded.

Diagnosed bronchial asthmatics will qualify as subjects in the five-year Yoga Asthma Study. This scientific project is documenting the effectiveness of yoga in the management of asthma.

Your participation will bring relief to many others.

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YRF News

Editorial

Dr Swami Karmananda Saraswati, MBBS (Syd)

This editorial examines the intrinsic and extrinsic causes of asthma in the light of repressed personality factors and parasympathetic dominance, and the part yoga can play in changing these negatively learned responses.

The power of yoga has been revealed to most of us working under the umbrella of the Yoga Research Foundation, in particular, and the yoga therapy field, in general. Naturally we are anxious that this ancient science should be adequately evaluated for its healing potential in the area of clinical medicine. Our aim is to demonstrate with clinically derived evidence, that yoga can positively influence and improve general health, especially those diseases which are stress related or psychosomatic. This category includes 80–90% of all human ailments.

Belonging to the latter category, asthma has been chosen as the initial project of the Yoga Research Foundation. Another reason for the choice is that asthma is a disease which is definitely on the increase worldwide. In Australia it is estimated that one in eight children develops asthma. Simultaneously, there is an alarming increase in deaths from this disease in both Australia and New Zealand. The mortality rate seems to be occurring despite, or in defiance of, the advances in modern medication and treatment facilities. The situation presents a major worry to the medical community. In India, the report from the World Conference on Immunology, in Bombay (January 1989), states that a staggering 25 million Indians are suffering from the disease.

Current treatment approaches

Patient education – In Western countries, the major effort in the management of asthma is being directed towards patient education. The Australian Department of Health produces

videos as educational tools. The videos are solid in terms of content, but perhaps they suffer from a limitation as regards asthma management. It may be possible that poor patient compliance in taking medications is not the only factor which can be improved in the effort to reduce the morbidity and mortality.

The asthma education program emphasizes to patients that they cannot subjectively assess the progress of their asthma, and stresses that they are not to change their medication under any circumstance excepting the doctor's instruction. The YRF has adopted this recommendation in the present study. However, the YRF has noticed that in India, many of our subjects DO change their dosages and add or subtract other medication according to their feeling and assessment of their condition, despite having been advised not to do so. This is the actual situation.

Patient integrity – Once the patient has developed sufficient awareness, he or she need not be removed altogether from the continuing decisions about medication requirements. Subjects should be able to decide for themselves, after adequate experience and education, how and when to use medications. The regular process of filling daily record charts and recording peak flow meter readings will considerably aid the sensitivity and awareness of the patients towards monitoring their own state.

A paradox

A second point concerns the increasing emphasis on medication as the only effective means of controlling asthma. An exclusive belief in medication is unrealistic. If improving medications and patient compliance were the total solution to the management of asthma, then we would not have the problem we face today. We have to ask, why is it, that precisely in those societies where this management philosophy has been implemented with the most ardour, there is instead an increasing incidence of status asthmaticus deaths and acute hospital admissions?

The current approach does not reflect better control but only shows that suppression of an illness does not provide any

ultimate or total solution. It is not enough to merely suppress the symptoms of bronchospasm, just as it is not enough to suppress the symptoms of blood pressure. We, as physicians and scientists, will have to go deeper and more carefully into the illness with our patients.

There is ample evidence that asthma is a disease with intrinsic causes as well as extrinsic causes or triggers. Unless we are able to help the patient recognize and come to terms with intrinsic factors such as emotional tension, suppression of earlier life experiences, etc., then we may not be able to really provide much help, beyond offering relief of acute, recurrent episodes or trying to permanently suppress the symptoms altogether.

We must come to recognize the benevolence of Nature. Life is evolutionary in its processes. The fact that something refuses to be suppressed and forces its way into awareness again and again means that it is demanding to be dealt with and that more attention and greater consideration has to be paid to this aspect of the condition.

Proposed intrinsic mechanisms

Childhood experiences – Some researchers point to emotional factors as playing an important role in asthma. They suggest that the psychodynamics of asthma may often involve an overly protected child, whose self-expression is smothered at the psycho-emotional level, hence the struggle to breathe freely. Other research has drawn the conclusion that there is often a history of loss of the mother's affection very early in life or some disruption of the secure parental and home environment which leaves the individual nursing a deep and subconscious feeling of rejection and a great need for security and affection. Both over-nurture and rejection are blamed as psychological mechanisms predisposing a child to asthma, and the research cannot be accepted as definitive. Other theories propose difficult delivery and respiratory distress at the time of delivery as cause of bronchial hyper-irritability.

Perceived threat

I would like to propose a general theory to explain the mechanism of intrinsic asthma alongside consideration of extrinsic causative factors. It may be the case that the asthmatic perceives him/herself living in an environment which is basically threatening. Early experiences have programmed the autonomic and immune system in such a way that the person feels emotionally isolated from others and even from the air that he/she breathes. As a result, the asthmatic perceives as threatening many situations which another person would find quite normal.

Such unconscious influence may explain how a change in external conditions, (for instance a cold change, or seasonal increase in pollens, or an increase in smoke or fumes) may be perceived autonomically and immunologically in the asthmatic as a reiteration of the conviction that the environment is unfriendly towards him/her. Thus the previously formed patterns and responses responsible for evoking fear and panic are brought into consciousness. Once triggered, the situation leads to an inevitable conclusion of a vicious circle of an attack or episode or respiratory distress. In contrast, a normal person will perceive the same external changes but, not being hampered by the burden of prior alienation or distrust of the world, is able to adapt and take the altered condition or stress in his stride without eliciting the response of accelerating panic and fear.

Parasympathetic dominance

Asthma is a disease in which the parasympathetic nervous mechanisms are dominant. Bronchial hyper-reactivity itself is mediated by the parasympathetic nervous system. In psychological terms, the parasympathetic response to stressful encounters is interpreted by researchers as one of contraction and increased passivity. It is a 'turning off' reaction: 'I prefer to retreat from this threat rather than engage in a struggle to try to improve my situation.' Conversely, the wish to improve the situation is the more common reaction among those who show the sympathetic 'fight or flight' response.

If this is so, then we might expect the asthmatic to have a generally more contracted energy pattern and to be poorly grounded or related to the real world and environment. Interestingly, Kirlian photography shows the so-called Kirlian aura around the feet of asthmatic subjects to be contracted and dull compared to photographs of the feet of non-asthmatics.

Extrinsic factors

Smoke, air pollution, fumes, pollens and animal dangers are known to trigger asthma in some individuals. However, in the light of a prior, unconsciously programmed emotional retreat when confronted with threatening situations or environments, it would only be in the extreme cases that extrinsic factors alone would be the sole trigger of the asthma attack.

Of course, a frankly hostile environment such as a coal mine full of dust, or a very polluted city, may be sufficient causes to trigger wheezing and allergic responses in most people. Perhaps only the most sympathetically predominant of individuals would not perceive such an environment as threatening. Most would develop respiratory problems. However, in those cases where most people remain symptom-free, we may be able to conclude that the person who does exhibit symptoms is predisposed due to pre-existing intrinsic 'hostile environment' programming and conditioning as previously described.

Yoga therapy

If the proposition that the asthmatic suffers from a pre-existing contracted energy state is correct, then what should be the approach of the therapist? In the first place, yoga would strongly disagree with the argument of some researchers that bronchial hyper-responsiveness is a characteristic which one can no more alter than the colour of one's skin. Such an attitude, we feel, is a fatalistic and negative assessment of an asthmatic's predicament. In fact, we believe that it is eminently possible to recognize from where the fear and contraction has originated and to systematically set about changing learned responses. As different responses are learned and reinforced, then the state

of parasympathetic predominance can be rebalanced towards a state of balance wherein the immunological memory can be relearned. The relearning will be accompanied by removal of energy contractions and blockages. Improved vitality and energy result as well as a less fearful approach to life.

Body-mind – Asanas and pranayamas are also very important in the process. From the point of view of yoga, the body and mind are recognized as being closely connected. Techniques are used on one to directly influence the other, and vice versa. This is why the practices of hatha yoga such as neti kriya, kunjal kriya and shankhaprakashalana are so effective. Their effect upon the mind is as profound as their action upon the body.

Ashram environment – In conjunction with the body-mind practices, karma yoga and bhakti yoga are also very important because they provide the background and positive environment in which the expression of new responses and environmental interactions can occur. The ashram environment is tailored specifically for the purpose of providing suitable surroundings in which the growth of vitality, expression and expansion of energy can take place.

Yoga therapy offers the patient the opportunity for insight into negative responses to daily situations and the growing ability to change such responses in the interests of improved health and quality of life.

Yoga and Mental Health

Dr L.I. Bhushan, Professor of Psychology & Dean, Faculty of Social Sciences, Bhagalpur University

ABSTRACT: *The paper discusses the postulates of yoga as a science of mind. The yogic practices not only serve as prevention and cure of mental disorders but also result in mental peace and higher psychic and spiritual attainments. In the yogic psychophysiology of the pranic system, the body, mind and spirit work in an integrated manner. Expansion of consciousness takes place through the awakening of the chakras. The paper reports findings based on scientific data to demonstrate the psychotherapeutic use of yoga, and underlines some simple yogic techniques for mental health.*

Introduction

Yogic techniques, such as asana and pranayama of hatha yoga, and various meditations, have been trialled through clinical and other scientific procedures. The results have established the preventative and therapeutic applications of the yogic practices. The explanation of the underlying physiological and chemical basis of these practices has given them wide appeal and acceptability throughout the world. We have witnessed their success in curing some supposedly incurable common diseases like asthma, diabetes, hypertension, etc., without causing adverse side effects. However, the world of science is yet to appreciate fully that yoga is basically a science of the mind.

According to Patanjali, the primary aim of yoga is to restrict modifications or tendencies of the *chitta* or mind – *Yogaschitta vritti nirodhah*.¹ Yoga analyzes, removes and sublimates different types of *samskaras* or complexes with the view of restoring equilibrium in the personality and training the mind for higher psychic and spiritual attainments. As expressed by Swami Satyananda, ‘Yoga is a science of consciousness.’² Explaining further, he states that

yoga provides mastery over all the stages of consciousness or awareness and makes us spectators of experience. It is revealing to note that Freud's postulate regarding the three levels of mind (conscious, subconscious and unconscious) towards the end of the nineteenth century was conceived well over two thousand years before by Patanjali in his *Yoga Sutras*. He described the different levels or stages of consciousness and clearly stated that only a small fragment of the mind was conscious, while its larger part was unknown.

Yoga has developed methods of experiencing the different levels of consciousness and encompasses the concept of the superconscious mind. Consciousness may function without the help or medium of the sense organs, beyond sense consciousness which we experience every day. One can see without eyes, think without brain, hear without ears and feel without any sensorial mediumship. This is possible when through yogic practices one succeeds in breaking the barriers between different levels of consciousness. The small area of the conscious mind based on sensory experience is expanded, and the whole mind merges into what is called the superconscious mind. This state of mind is also known as cosmic consciousness or transcendental awareness. The ultimate aim of yoga is expansion of this consciousness.

Superconsciousness is not a concept limited to the philosophical level. Neuroscientists now promote the inadequacy of the neurological basis of our experiences, and Eccles³ goes to the extent of saying, "since materialist solutions fail to account for our experienced uniqueness, I am constrained to attribute the uniqueness of psyche or soul to a supernatural spiritual creation." In an appealing analogy he regards the body and brain as a superb computer, and the soul or psyche as its programmer, without which the computer is not only incomplete but meaningless. This is very close to the Indian view that the mind is merely an instrument of the atman.

Integration

Yoga aims at developing an integrated personality of which the body, mind and spirit are integral components. It does not operate within the old mind-body dualism of Cartesian thought, which separates physical from mental health. Human happiness depends on physical fitness, mental agility and spiritual verve. Spiritual joys and mental delights are subject to bodily conditions, free from every type of ailment. Yoga is a path to both physical and mental wellbeing and higher spiritual awareness. Thus it presents a wider spectrum than modern viewpoint of psychosomatics which accounts for bodily ailments only on a functional basis.

The real objective of yoga is to attain peace and tranquillity within. Those who sincerely practise yoga are not only free from stress and anxiety; rather they remain undisturbed like the ocean. Yoga, therefore, is not only a science of mental diseases but a complete science of mental health. It is both preventative and curative of mental disorders and at the same time capable of producing mental peace and cosmic consciousness. As such, it is both a positive and normative science.

The body-mind interactional approach is strictly observed in the different practices of yoga. Patanjali's steps of raja yoga bears testimony to this. Of the eight steps, the first four: yama, niyama, asana and pranayama are exoteric and are considered to be the psychophysiological preparations for the actual yoga practices. The practice of yoga proper, begins with the fifth step, *pratyahara*, which is withdrawal and control of the senses. Pratyahara, along with the next three steps of raja yoga, namely *dharana*, concentration on one object or idea, *dhyana*, meditation, and *samadhi*, sublime equanimity, is esoteric and primarily psychological and psychic. Thus in the eight steps of raja yoga the practices at the physical and psychological levels are counterbalanced. They present a balanced combination of the physiological yoga of vitality with the psychical yoga of meditation. In fact, no asana, however elementary or difficult it may be, is purely

a physical exercise. It is done with full awareness, generally with closed eye and in rhythm with the breath, resulting in a cohesive integrated functioning between the body, mind and prana.

The pranic system

Prana refers to the vital energy without which the body is lifeless. The pranic system provides the psychophysiological basis of the theoretical model and practices of yoga. Regular and free flow of prana keeps a person physically fit and mentally sound. The practice of pranayama aims at expansion and regulation of prana which is linked with the breathing process. Prana, through the breathing process, provides a link between one's physical body and subtle body.

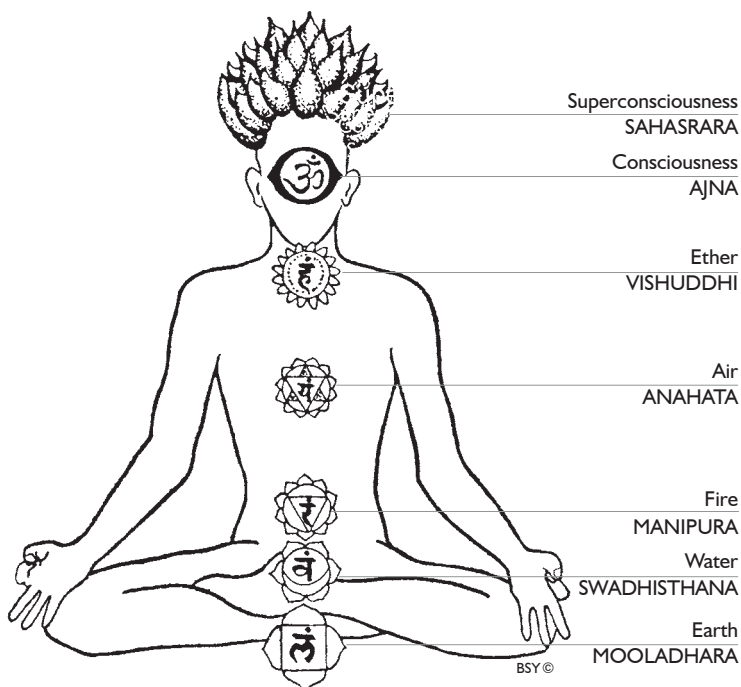
Prana flows through seventy-two thousand channels called nadis. The major three are known as ida, pingala and sushumna. When the breath is dominant in the left nostril it indicates the flow of ida nadi. When the breath is dominant in the right nostril it indicates the flow of pingala nadi. When the breath is equal in both the nostrils sushumna is active. In a healthy person the three nadis flow alternatively – ida and pingala for 60 to 90 minutes each and sushumna at the cross-over period for a few minutes, all in a balanced manner.⁴ Because of various situational and internal reasons, this balance is rarely maintained. Imbalance in the flow of prana between ida and pingala nadis gives rise to various organic and psychological disorders and complications. Excessive flow of ida nadi results in activation of the parasympathetic nervous system and makes the person a psychological case. Similarly, excess flow of pingala nadi stimulates the sympathetic nervous system and makes the person extremely active, and may cause somatic problems. Blockages in the flow of prana result in body toxins. The bulk of psychic energy passes through sushumna, the central channel. The flow of prana through sushumna, called kundalini shakti, is considered best for concentration and meditation. Yogic practices, particularly pranayama, help in establishing a

balance between ida and pingala, clearing the channels and removing internal toxins, expanding the respiratory cycles, increasing vitality and lifespan and preparing the body and the mind for higher meditation.

Kundalini yoga

There are many different methods of meditation. Yoga presents a vivid and sound meditational procedure for attainment of superconsciousness through the awakening of kundalini, one's spiritual energy. In visual imagery, kundalini is depicted as a serpent resting in three and a half coils at the base of the spine. Awakening of kundalini can take place through gradual activation of the seven energy centres or chakras. These chakras are visualized as whirling wheels of energy rotating clockwise on their axis in sushumna.

<i>Chakras</i>	<i>Meaning</i>	<i>Location (see diagram)</i>
1. <i>Mooladhara</i>	Basic centre	In the area of the perineum
2. <i>Swadhisthana</i>	One's own abode	Near the tail bone
3. <i>Manipura</i>	City of jewels	Behind the navel in the spinal cord
4. <i>Anahata</i>	Centre of unbeaten sound	Behind the heart in the spinal cord
5. <i>Vishuddhi</i>	Centre of purification	Behind the throat in the spinal cord
6. <i>Ajna</i>	Command centre	In the pineal gland
7. <i>Sahasrara</i>	One thousand petalled lotus flower	At the top of the head



The diagram indicates the position of the chakras and their related tattwas (frequencies of prana and consciousness)

Psychic energy activates the seven chakras which control our physical, emotional, mental and spiritual bodies. As long as sushumna is closed at both ends and kundalini rests at mooladhara, the limited psychic energy of the human organism courses only through ida and pingala, the left and right sides of the body. Over-activation of either ida or pingala opens the risk of developing psychopathy and misbehaviour. However, Swami Satyananda states, “By using definite yogic methods in which the pranic force or vital energy is injected or circulated in the organ, the psychic, spiritual and occult faculties contained in mooladhara begin to manifest. This particular centre is believed in yoga to be the basic centre where the vital energy lies coiled and which,

when aroused, starts to ascend in the spinal cord to the other psychic centres.”⁵

When the dormant mooladhara is awakened, kundalini shakti can start to flow, and with the gradual arousal of the chakras through yogic kriya techniques, the spiritual aspirant succeeds in attaining superconsciousness or cosmic awareness. The literature prescribes several necessary conditions, rules, precautions and methods or sadhana, for stimulating the chakras and awakening kundalini.

Yoga in psychotherapeutic use

Certain scientific findings justify many of the yogic assumptions and demonstrate the psychotherapeutic value of yoga practices. Vahia et. al.,⁶ elaborately dealt with the practice of various techniques of Patanjali and their therapeutic implications in the treatment of psychiatric patients. They found the yogic treatment to be more efficient than psychoanalysis or psychotherapy, eclectic psychotherapy and behaviour therapy. They later⁷ put forth a new approach termed psychophysiological therapy based on the concepts and techniques of Patanjali like asana, pranayama, pratyahara, dharana and dhyana. According to the authors, Patanjali's technique begins with control over the voluntary musculature, subsequently over the autonomous nervous system and, still later, over the thought process.

Udupa et al⁸ studied the psychological and biochemical responses to the practice of hatha yoga in a group of young subjects. On the basis of the findings they pointed out that the practice of yoga makes an individual psychologically more stable and mentally more alert. Datey et. al.,⁹ indicated the usefulness of shavasana in the therapeutic management of hypertension. Champa, Rao and Murthy¹⁰ found shavasana efficacious in relieving anxiety. Patel¹¹, using yoga and biofeedback, found the yogic techniques useful in the treatment of hypertension.

A number of case studies and other findings indicate that neurotic and psychotic patients and cases of neural

disorders can be successfully treated by the practice of different forms of meditation. Meditation develops the willpower and frees the mind from the arrest of wrong notions, whims and fears. Transcendental meditation (TM), a mechanical method of indigenous origin, has come under much scientific scrutiny: Bloomfield et. al.,¹² and Wallace.¹³ Boudreau¹⁴ reported a case of claustrophobia and another of profuse perspiration which were therapeutically successful under TM and yoga while systematic desensitization was only partially successful.

Thus the findings of clinical research confirm the psychotherapeutic usefulness of yoga practices and suggest their superiority to other popular psychoanalytic and behavioural therapies. Psychoanalysis and yoga differ not only in method but also in their aims. The aim of psychoanalysis is to resolve the conflicts and strengthen the ego so that the individual is better adjusted to the normal demands of situations, but the aim of yoga is not only to remove mental strains but also to transcend the ego consciousness so that spiritual consciousness may dawn.

Some yogic techniques for mental health

In our earlier discussion a number of yogic techniques and their efficacy in relation to mental health were mentioned. In fact, every yogic practice, even physical postures like asanas have psychological implications. Vajrasana, shashankasana, anandamadirasana, garbhasana, as well as pranayama, have been found useful in removing depression. Similarly, vipareeta karani mudra, shalabhasana, yoga mudra and shavasana are helpful in alleviating nervousness and improving memory. Kapalbhathi and bhramari pranayama relieve nervous tension. The practice of karma yoga, kriya yoga and meditation help reduce anger, anxiety, stress and mental disturbances and train the mind for higher psychic attainments. However, special mention must be made of a few such techniques or practices which are simple but have been found to be extremely beneficial from the viewpoint

of mental health, and for the treatment of behavioural problems. These include yoga nidra, antar mouna, ajapa japa and pratyahara.

Yoga nidra, or psychic sleep, is primarily a relaxation technique. Relaxation is useful not only for mental and cardiac patients but for all men and women engaged in various work. How to relax is a problem for which yoga nidra specifies a standard, systematic and scientific procedure. It is a more efficient and effective form of psychic and physiological rest and rejuvenation than conventional sleep. Practice of yoga nidra changes the nature of one's mind, cures diseases, restores creative genius and develops the capacity to penetrate into the depths of the human mind.

On the other hand, the practice of *antar mouna* or inner silence is a practice of mental relaxation and impartial observation of thoughts and ideas. We know conflicting thoughts and desires at times cause strain and psychosomatic problems. Similarly, when one concentrates and tries to unify the vagrant tendencies of the mind, one finds it difficult and at times strenuous. The detachment practised in antar mouna is useful in bringing about mental peace and quiet. This practice removes any permanent thought that haunts the mind.

Ajapa japa is the spontaneous mantra of the breath. It is said that the breath goes in with the sound of *So* and comes out with the sound of *Ham*. This is the sound of ajapa gayatri which the individual continuously repeats. The practice of ajapa japa offers significant benefits for mental disorders and its therapeutic effects can hardly be over-emphasized.

Lastly, pratyahara is a useful technique of Patanjali's raja yoga for bringing about transformation of mind and experience of peace and concentration. Through the techniques of pratyahara, the wandering and restless mind, usually engaged in perceiving the external stimuli through the senses, is transformed, and one starts looking within. This leads to mental concentration and higher stages of meditation.

These are some of the very simple meditational processes in yoga which can be practised by both mental patients and normal individuals to improve their mental health.

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Comparison of Urinary Catecholamines and Cortisol During Hatha Relaxation and Taped Music Relaxation

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ABSTRACT: *In twenty experienced yoga practitioners urinary noradrenaline was found to increase significantly after one hour of hatha yoga relaxation and an equivalent period of taped music relaxation. Urinary cortisol, however, was found to decrease after the yoga relaxation and to increase after the music relaxation. The implications for future research and clinical applications for stress disorders are discussed.*

KEYWORDS: *catecholamines/cortisol/yoga/relaxation/stress*

Introduction

Comparisons of the endogenous biochemical concomitants of different relaxation techniques are not common in the scientific literature. This is surprising, since biochemical accounts of the effects of other hypometabolic states such as sleeping are prolific.¹ Biochemical studies of the relationships between subjective arousal and physiological change have also been applied to psychopathology and physical exercise. In Frankenhaeuer's² review, dozens of findings linking increases in catecholamines and cortisol with emotional stress are reported, as well as Forsman's comprehensive review on stress.³ Harte and Eifert found an increase in plasma cortisol after 50 minutes of stressful exercise.⁴ Interestingly yoga teachers anecdotally report that a one-hour session of yoga postures (hatha yoga) is actually relaxing and not stressful in nature. If this were the case,

we could expect corresponding alterations in endocrine secretion.

Jevning, Wilson, Vanderlaan and Levine⁵ found that plasma levels of cortisol in 12 experienced (3–5 years) yoga practitioners decreased during relaxation (meditation) and also decreased relative to non-practitioners who rested with their eyes closed. Udupa, however, though describing a decrease in plasma cortisol after surya namaskara (see Appendix) reported an increase after the more physically demanding hatha yoga postures of sirshasana and mayurasana (see Appendix).⁶ Udupa also reported that periods of 3 or 6 months of hatha yoga produced an overall increase in urinary and plasma levels of catecholamines.⁷ The implication from Udupa's work is that the physical aspects of hatha yoga postures facilitate catecholamine and cortisol release. If catecholamine and cortisol secretions are indicators of physiological arousal, these findings indicate that hatha yoga is more physiologically similar to physical exercise than the comparatively inactive meditation practice studied by Jevning et. al. When postures are combined with meditative relaxation, the patterns of biochemical change may be different.

There have been various attempts at designing relaxation methods of a 'non-Eastern' nature. Examples of this are the Relaxation Response⁸ as well as instructional tapes of verbal suggestion or bland music. Although the physiological benefits of the Relaxation Response are well documented⁹, the benefits of taped relaxation training have not been thoroughly investigated. While such techniques may be physically relaxing, psychological benefits may not be as evident as in yoga practices.

Aim

The aim of this pilot study was to compare on a biochemical level, the effects of an integral form of yoga (where individuals practised a combination of breathing, postures and meditative relaxation) with taped music relaxation.

The hypothesis was that, due to a decrease in physiological arousal, both types of relaxation would be characterized by a decrease in urinary cortisol and catecholamines. Subjective evaluation, however, may favour the yoga practice.

Method

Twenty subjects (8 female, 12 male) were volunteers recruited by letter from the North Queensland Yoga School and James Cook University. Their mean age was 26.3 years (SE 1.3) and mean length of yoga experience was 6.5 years (range 5–15 years). All had undergone a similar course of training in hatha yoga techniques and practised at least twice a week.

As novel situations can affect 'catecholamine and cortisol levels', all subjects were introduced to the experimenter, laboratory and procedures on a day before testing began. Individuals were instructed to avoid consuming alcohol and caffeine in the evening preceding the lab sessions and to fast and avoid strenuous physical activity in the mornings. Each person was tested according to three one-hour conditions:

- A. hatha yoga relaxation (20 minutes of postures, 20 minutes of breathing and 20 minutes of relaxation with breath awareness), (see Appendix)
- B. taped music relaxation, and
- C. a control condition of quiet inactivity.

Test sessions were conducted on separate days but at the same time of the day. All testing was confined to the hours between 5 am and 8 am, in order to standardize, as much as possible, subjects' excretion rates of the biochemical substances measured. To check carry-over biases due to preference for particular conditions, subjects were tested in different orders, as follows: 3 subjects began with A, then did B the next day, and on the final day came to the control session, C; 3 were tested in the order A B C; 3 in the order B C A; 4 in the order C A B; and 4 in the order C B A. All testing was undertaken in comfortable, air conditioned and soundproofed research rooms in the Behavioural Sciences building at James Cook University. The rooms were devoid

of furniture, except for a selection of blankets and small mattresses on which subjects could relax comfortably.

Pulse rates per minute were taken manually by palpating the radial pulse before and after each test and control condition. Urine samples were collected before and immediately after each session. Urinary catecholamines and cortisol were determined by fluorimetry and HPLC (high performance liquid chromatography) respectively and expressed as fractions of the metabolic enzyme creatinine. Data was analyzed using students t-test and analysis of variance (ANOVA). Subjective evaluation of the activities was scored according to a 9-point scale of 'liking', administered directly after each condition. Scores were as follows:

0. not at all (liked)
1. extremely weak (ly liked)
2. very weak (ly liked)
3. weak (ly liked)
4. medium (ly liked)
5. strong (ly liked)
6. very strong (ly liked)
7. extremely strong (ly liked) and
8. maximal (ly liked).

Results

Results of the endocrine secretions are set out in Table 1. Noradrenaline increased significantly ($p < 0.005$) after hatha yoga relaxation and taped music relaxation ($p < 0.05$) There was no significant change in adrenaline levels after either hatha yoga relaxation or taped music relaxation. Cortisol excretion decreased significantly ($p < 0.05$) after hatha yoga relaxation and increased significantly ($p < 0.05$) after taped music relaxation. There was no significant change in any biochemical parameter after the control condition. A two-factor ANOVA with repeated measures revealed a significant interaction between the repeated measure and conditions for cortisol ($F = 6.78$, $p < 0.005$) but not for the catecholamines.

TABLE 1

Means and standard errors for adrenaline, noradrenaline, cortisol and pulse rate over a repeated measure and over conditions. Endocrine values are expressed according to creatinine excretion.

<i>Conditions</i>	<i>Adrenaline</i> <i>umol/mmolX10</i>		<i>Noradrenaline</i> <i>umol/mmolX10</i>		<i>Cortisol</i> <i>nmol/mmol</i>		<i>Pulse rate</i> <i>beats/min</i>	
	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>
<i>Hatha Yoga</i>	5.5	0.7	3.1	0.5	45.5	6.6	68.4	3.4
	4.6	0.9	5.1	1.0 (p<0.005)	31.4	6.1 (p<0.005)	62.1	2.6 (p<0.005)
<i>Relaxation</i>								
<i>Music</i>	6.9	2.9	3.3	0.7	20.4	2.6	67.3	3.1
	6.0	0.9	6.0	2.2 (p<0.05)	36.1	5.7 (p<0.05)	63.3	2.8 (p<0.05)
<i>Control</i>	4.1	0.8	4.0	1.1	26.7	3.6	67.4	2.9
	5.3	0.7	7.9	3.9	32.0	4.0	64.4	2.6

Pulse rate decreased after hatha yoga relaxation ($p < 0.005$) and after taped music relaxation ($P < 0.05$). There was no change in pulse rate after the control condition. A two-factor ANOVA with repeated measures revealed a significant variance over the repeated measure for pulse rate ($F = 10.29$, $p < 0.005$) but there was no interaction over conditions. The hatha yoga condition was evaluated highest (mean score 6; SE 0.9) and the music relaxation lowest (mean score 2; SE 0.5).

Discussion

As stated, the hypothesis was that both types of relaxation would elicit physiological and biochemical signs of physical relaxation, although the yoga session would be subjectively evaluated higher than the taped music session. In fact, adrenaline level remained unchanged and noradrenaline increased after both hatha yoga relaxation and taped music relaxation. As pulse rate decreased after both test conditions, the change in noradrenaline could be related to subjective arousal. Urinary cortisol, however, decreased after hatha yoga relaxation and increased after the taped music, indicating that the type of subjective arousal may have differed between the two types of relaxation. According to 'liking' scale, subjects preferred the yogic relaxation. In fact, many reported that whilst they felt physically relaxed after the hour of taped music, they found the music distracting, one person reporting it as disturbing.

Hamburg¹⁰ found that cortisol levels differed according to levels of personal distress. Specifically, he found that socially approved anger was less likely to facilitate cortisol secretion than anger which is not socially approved and therefore more mentally stressful. Here, as in the present results, we have a similarly strong emotion characterized by different subjective arousal and according changes in cortisol secretion. Yoga practitioners consider relaxation to involve physical, mental and emotional components (see Appendix). The diversity in cortisol over the two test conditions suggests

that this steroid could be an important indicator of negative effect (emotional response). Because cortisol levels decreased after hatha yoga relaxation and increased after taped music relaxation, the implication here is that although both types of relaxation seem to be immediately physically quiescent, positive emotional effects through taped music may not be gained by practitioners.

Conclusion

It is becoming a common practice for medical practitioners seeking a positive alternative to tranquilizing medications to either provide patients with relaxation tapes (with relaxation instructions or specifically designed relaxation music), or to refer patients to relaxation therapists who may utilize such tapes in stress management. This study provides evidence that such tapes may be inadequate in long-term treatment for stress. It is also indicated that more complete physical and emotional relaxation may be obtained from a properly constructed program of yoga postures, breathing and meditation type techniques tailored to the physical capacities of the student.

Confirmation of these results may require subsequent studies involving persons not previously trained in yoga or any relaxation technique.

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Appendix

Full descriptions of yoga postures may be found in:

Saraswati, Swami Satyananda, *Asana Pranayama Mudra Bandha*, Munger, Bihar School of Yoga, Munger, 1982, or
Iyengar, B.K.S., *Light on Yoga*.

Postures in this study included:

surya namaskara, mayurasana, lotus posture, sirshasana, dhanurasana and bhujangasana.

Breathing techniques included:

bhastrika and nadi shodhana pranayama.

Relaxation involved breath awareness.

Some Preliminary Ideas for Research into Attention

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ABSTRACT: *An experienced educator and yoga practitioner sets out the definitive aspects of attention and how to train this often elusive quality with a variety of yoga techniques. She stresses the concept of inner attention as well as outer attention and the necessity of research to correlate the yogic practices with different categories of attention already examined neurophysiologically.*

Psychologists, psychiatrists, neurologists: neurophysiologists have erred together in their undue emphasis on the conscious components of mentation. This has led the educator into neglecting the preconscious instrument of learning, which is the effective instrument of recording, processing and of creating.

—L.S. Kubie¹

Introduction

Attention, turning the mind or an aspect of it, towards something is in great demand in modern life. Yet most find attention, in the form of one-pointed concentration, difficult to attain. This is largely due to the manifold distractions of and decisions necessitated by our democratic, consumer-oriented society. As Thoreau pointed out in *Walden*, “Our life is frittered away in detail” – a point he attempted to prove by rebelliously existing for a few summers with the bare necessities, including morning readings of the *Bhagavad Gita*, by a Concord pond. Yet, as I will attempt to show in this paper, there are many different aspects to attention and many different ways to train its effectiveness. In particular, it may no longer be valid, in an educational or meditative setting, to equate effective attention with one-pointed concentration.

Splitting of the attention

In his classic chapter on attention in *Principles of Psychology* (1890) William James proposed that, “The practical and theoretical life of whole species, as well as of individual beings, results from the selection which the habitual direction of their attention involves . . . each of us literally chooses by his (or her) way of attending to things what sort of a universe he (or she) shall appear to inhabit.”²

As Davidson and Coleman point out, the major implication of this is that our habitual pattern of attention may be supposed, over time, to influence the content of our mind and emotions and thence our behaviour and experience.³ The concert musician who, by repetitive, attentive practice, trains his or her fingers to play a certain scale is, by this reinforcing of a particular, sequential pattern of proprioceptive impulses, developing specific groups of neuronal synapses in areas of the central nervous system such as the basal ganglia and cerebellum. Attention thus changes the physical structure of the brain to create an *engram* or program of activity which can initiate an extremely complex series of movements without the need for conscious guidance via neuronal pathways from the motor cortex.⁴ Similarly, the person suffering from chronic ‘malattention’ may develop measurable changes in neural structure on an electroencephalogram, that correlate with poor work performance and impaired social relationships.

In my work with Research on Yoga in Education (RYE), I have increasingly become aware that many modern behaviour patterns are leading to a split of attention amongst the young. Listening to walkman or radios while reading and/or watching television; zapping (rapid switching of television channels by remote control) are often bemoaned as factors in an apparent degeneration of youthful faculties and hence of national productivity and character. Indeed such behaviour seems a direct contradiction of the classical ideas we have about the management of our intellect. That is, attention to be effective should be focused on one thing

at a time. Such problems have stimulated my interest in attention and in the development of methods for its training.

The conversion of split into double or triple attention

Many famous people who lead enormously productive lives had developed that capacity to direct their attention to more than one thing at a time. Napoleon, for example, was reputedly able to dictate sentences for four different letters, returning to complete each with perfect recollection of its contents. Such anecdotes lead me to consider whether children and adults might be able to train their habituated split attention into effective dual or triple attention.

One technique I have used is to get students to listen to a story while working at multiplication. Afterwards the level of effective double attention is checked by verifying whether the story can be retold correctly and that the mathematics is accurate. Another practice involves rows of students behind each other with readers at the end of each line. The readers recite different articles. The first stage in training the attention is to listen to one person only. The second is to try and listen to both at the same time. The third stage is to try and give an account of the context of both articles. It is like, in a restaurant having a dialogue with someone, and later relating the conversation at the next table.

Peripheral or non-focused attention

Other existing methods of education attempt to train attention to effectiveness without utilizing the one-pointed concentration that modern human beings find so difficult. The Lozanov method of learning, especially of languages, (called Suggestopedia) develops peripheral or non-focused attention. The student is desensitized to the stress normally associated with one-pointed concentration. It is a complex method and difficult to describe fully here. In a related method, 'Superlearning', a list for memorization is read with the student mentally repeating each word during breath retention, then exhaling and inhaling between repetitions.

Thereafter certain types of Baroque music are played (with sixty beats per minute, e.g. Pachelbel's 'Canon') while the text is again read. Finally, retention is tested by an attempt at mental repetition. This method also works on the principle that when the mind is relaxed more information will be retained, even without one-pointed concentration.

Attention in relation to the inner and outer world

So far, I have discussed attention in relation to the external world, yet the concept is equally important in relation to our inner state. Our attention on personal thought processes and emotions ultimately provide the secure basis of self-understanding and strength from which effective social interaction can take place.

Shapiro has written of 'three broad general groupings of attentional strategies in meditation: a focus on the field' (mindfulness meditation like Zen's shikan-taza); 'a focus on a specific object within the field' (the classical, one-pointed concentration of raja yoga); 'and a shifting back and forth between the two', vipassana and transcendental meditation.⁵

Citing Pribam's work on neuropsychology⁶ Shapiro describes brain attentional mechanisms as being like a camera: one type involving a focus similar to a wide-angled lens – a broad, sweeping awareness taking in the entire field (mindfulness meditation); the second type is like a zoom lens – a specific focusing on a restricted segment of a field.

Such a definition of meditation appears to me to unnecessarily exclude the concept of double or triple attention – the focusing on more than one object within a field. During the meditation technique of ajapa japa, for example, the yogi is trained to be aware simultaneously of posture, of the psychic passage between navel and throat, of the breath passing up and down this passage, of the mantra *So Ham* and of any thoughts arising during the process. Likewise, highly advanced meditation states appear to involve double attention in an even more subtle sense. In nirvikalpa samadhi the yogi is simultaneously aware of

the Supreme Reality, as it is often called, and the external material reality. In gross neurophysiological terms this would be equivalent to the coexistence of EEG delta waves, characteristic of deep sleep, with the beta waves of normal waking consciousness.

The lucid dream – research into double attention

Lucid dreaming is one type of inner state double attention that is well researched and for which people can be trained. The term lucid dream was first used by Van Eeden in 1913.⁷ Since then a variety of researchers, such as Garfield⁸, La Berge⁹ and Tart¹⁰, have observed that while paying attention to the content of dreams certain subjects have faculties of attention normally characteristic of waking consciousness. These faculties are correct orientation in time and space (the middle of the night at home in bed), memory of waking life plans and intentions (recall of experiments planned for the night's dreams), perceptual vividness in any or all of the sensory modalities, and the ability to think logically and to choose consciously one's course of action as the dream story unfolds.

Prior to the availability of empirical evidence in the 1980s, research speculation favoured either 'micro-awakenings' or transition from Stage 1 REM to Stage 4 sleep as the psychophysiological basis of lucid dreams.¹¹ However, in 1980 La Berge and his colleagues at Stanford University arranged for alleged lucid dreamers to signal their realization of dreaming by means of dream actions with polygraphically observable correlates (i.e. eye movements and fist clenches). Thirty-five lucid dreams from 5 subjects were reported subsequent to spontaneous awakening from REM sleep (32 times), NREM Stage 1 (twice), and the transition from NREM Stage 2 to REM (once). All 30 signalled lucid dreams were found to occur during epochs of unambiguous REM sleep, and scored according to the conventional criteria.¹² A replication of the study with two additional subjects and twenty more lucid dreams produced identical results.¹³

As recorded by Evans-Wentz in his classic work on Tibetan yoga¹⁴, training in this form of inner double attention has been a traditional part of many meditative systems. The method of the contemporary Rajneesh requires trainee lucid dreamers to ask themselves during the day, “Is this a dream?” for three weeks continuously.¹⁵ This idea of carrying a question habituated in the waking state into the dreaming state has also been used in the research of Tholey.¹⁶ Other techniques for training dream/waking attention include meditation¹⁷, autosuggestion, where from only four lucid dreams in the first nine months are experienced, to four or five per month after five years¹⁸, and tactile or auditory stimuli to remind a subject that they are dreaming.¹⁹ Lastly, a tape recording of the phrase ‘this is a dream’ is played at gradually increasing volume, 5 to 10 minutes after the beginning of each REM period. When the tape was heard or the subject realized they were dreaming, they signalled by means of a pair of left and right eye movements.²⁰

La Berge, noting the positive correlation between lucid dreaming and high overall dream recall, educates subjects to classify the anomalies occurring in the content of their dreams to develop the skill of recognizing them as dreams.²¹ Castenada, in like fashion, details the method of resolving to carry out a particular activity in a dream in *Journey to Ixtlan: The Lessons of Don Juan*.²² Malamud recommends the keeping of a dream diary and underlining all the unrealistic or dreamlike happenings as a means for a subject to increase the realization that he or she is dreaming, through the recognition of bizarre occurrences.²³ Presleep negative emotions (for women only) and high level activity (for men only)²⁴ as well as sexual intercourse in the middle of the night²⁵, have all been proposed as stimulants to lucid dreams. This led La Berge to comment, “The diversity of the proposed activities suggests that it is not the particular activity, but the alert wakefulness that facilitates lucid dreaming during subsequent sleep.”²⁶

The yogic concept of attention

The yogic training for meditation bears many similarities to the subjects described above preparing themselves for lucid dreaming. The philosophy of yoga may thus provide a rich source of hypotheses about and techniques for the education of double attention. The terms customarily distinguished from attention are vigilance (the level of consciousness manifested as neural activity in the reticular activating system of the brainstem and measurable in clinical medicine by tests such as pupil size and cold calories) and awareness, the subjective sense of witnessing, the totality of attention at any particular moment.

In yoga philosophy, however, more detail is given. According to Samkhya philosophy, the mind is heterogeneous, made up of twenty-five, some say twenty-four parts amongst which are the senses. The common yogic analogy of the mind as a charioteer holding the reins of five wild horses, the senses, should not be seen as endorsing a mind-body duality. The act of training the attention in relation to the sense of hearing, for example, is not so much a process of educating the ears as of disciplining the subtle components of mind, *tattvas*, which utilize the ears primarily, but can use other channels as well. This may explain the anecdotal reports of highly trained musicians or deaf people learning to use their head or their whole body to receive sound. Likewise, I am aware of an experiment currently being carried out in France on a subject who claims to 'see' colours through her hand. She has published a book entitled *Non-Visible Colours*.

Yoga philosophy goes even further and defines that quality of mind which is able to collect information from the senses as *manas*. The faculty of mind which then makes sense of the data, comparing it with previous stores and evaluating it, is termed *buddhi*. The aspect of mind that relates data and evaluates their impact on a proposed self is called *ahamkara*. Without *buddhi* attention would accumulate information in the mind in telephone book form, that is, uncritically.

Without ahamkara we would be innocent and naive and, indeed, the lessening of ahamkara is a major part of many religious systems. Chitta is all mental contents: senses, manas, buddhi and ahamkara, except for the *atma*, the soul or sense of spiritual being. With ahamkara operating but not atma, we would strive to avoid being run down by a bus but would have no aspiration towards discovering or experiencing any higher purpose to life or exalted state of existence.

In yogic terms, atma is awareness or the witness that utilizes the components of chitta (senses, manas, buddhi and ahamkara) to experience the material world. Lucid dreaming may therefore involve a lessening of the attachment of atma with particular components of the chitta, possibly explaining why it customarily occurs in the early morning hours (4 to 6 am) traditionally specified for meditation.²⁷

Some yogic practices for training the attention

All yoga practices aim, in different ways, at training the attention. The need for variation arises primarily from the diversity of personality amongst practitioners. The following are illustrative examples.

In the tantric practice of kriya yoga attention is initially allowed contact with the external environment in the form of open eyes. Then unmani mudra is incorporated – gazeless vision where the eyes go up and down without seeing anything. The eye is paying attention to everything; yet nothing in particular, like the eyes of Buddha, half in the void and half in the external world. Conjointly, the attention is brought to psychic pathways within the body and to visualization where each stage prepares the attention for the next, more subtle stage.

The attention is trained in a similar fashion in bhoochari mudra. The palm is brought level with the bridge of the nose and the practitioner stares at the little finger. The hand is then removed and attention brought to the space that the little finger used to occupy. Attention on the now vanished shape is gradually transformed to an objectless attention on the field.

A practice such as antar mouna is very beneficial in the training of external and internal double attention. First I teach students to pay attention to far away sounds, then sounds directly around, such as voices around the house, the rustling oak trees, the sizzling of crepe suzette from the kitchen. Then I make tiny sounds in the room itself: turning pages, rubbing clothing. Finally, they listen to the sound of the breath in the nose. Having listened to all the sounds in turn, the students are asked to listen to them all together, then in different ways, with one ear or the other, with both ears, or even with one side of the body.

Finally, the yogic master Swami Satyananda Saraswati taught that the development of attention in the outside world is of great assistance in the development of inner attention. He instructed his students not to be vague or empty-headed in their outward dealings. "When you are outside, count the stars!" he exhorted, and once at a yoga convention at Chamarande, south of Paris, I saw him merely glance at a passing goods train yet have total recall of its number of carriages.

Proposals for future research with the Yoga Research Foundation

RYE has recently become associated with Dr Antonio Remond, Director of Research in the CNRS, Centre Nationale de Recherche Scientifique. My intention is to correlate the practices of yoga with the different categories of attention already examined by this neurophysiologist. The pathology of attention (dispersion, hypervigilance) will be studied, as well as ways to enhance it with better learning. The Yoga Research Foundation can greatly assist us with this work and I look forward to the completion of plans for joint or parallel experimental protocols in this area.

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(The author prepared this paper while visiting the Yoga Research Foundation as a Research Fellow in December 1989.)

Yoga and Physiotherapy in the Management of Asthma – Some Impressions

Swami Dayasagar Saraswati, BA (Hons) (Sussex), MCSP (Member of the Chartered Society of Physiotherapy, Glasgow)

As a physiotherapist with a longstanding interest in yoga, I have been routinely involved in teaching asthmatics how to relax their breathing as much as possible during an attack, trying to minimize the vicious circle of stress and inefficient respiration.

Diaphragmatic rather than upper chest breathing is encouraged. Karel Nespor, the Czech researcher on yoga therapy, associated for many years with the Bihar School of Yoga, said in a recent seminar that I attended that diaphragmatic breathing helps increase overall parasympathetic tone. Likewise, my experience with sustained upper thoracic breathing, i.e. in psychotherapeutic 'rebirthing' techniques, is that it appears to stimulate sympathetic tone and be associated with the production of negative emotions.

Breathing and mental patterns, however, seem to be interlinked at levels more subtle than this. My father, a medical practitioner in England, used to treat asthmatics with hypnosis. Once a young patient started to have an attack. My father asked the boy to describe what he was feeling at that moment. He seemed to express the sensation of drowning. My father went to the kitchen where the boy's grandmother was ironing. He asked her if she could recall the child having such an experience. She went red and said she had never told anyone, but once when she was looking after him as a baby, in the bath, she had to go and answer the phone and when she came back she found him face down in the water. He was not breathing but luckily she managed to revive him. When the child had this explained to him his asthma went away.

My approach, for a simple yogic program of management of asthma, therefore, would emphasize teaching breath

awareness and how the breath can be controlled, along with deep relaxation techniques such as yoga nidra. You can, for example, breathe more into your left thorax just by thinking it. If you give the patients something to breathe against (such as your hand against their chest) they breathe more to that side. This is something that is quite visible and can be demonstrated to a group of patients. Though I have seen no paper yet that supports the possibility of increased unilateral ventilation during such a manoeuvre, it makes physiologic sense that a period of muscle activity against increased resistance should enhance subsequent performance.

Asthmatics should also be shown how to have more breath control during exercise. All pranayama techniques will develop this, though obviously each has a different physiological emphasis. I have taught ujjayi to a lot of patients with respiratory problems. Ujjayi, like bhramari and pursed lips breathing, exerts a back pressure on the distal airways which tends to keep the bronchi dilated. As well as asthma, emphysema and chronic bronchitis are other common breathing complaints which benefit especially from this technique.

Asthmatics and other respiratory patients who get puffed walking up steps or slopes should learn to control their breathing to avoid distress. Movement, each step or series of steps, should be synchronized with the breath. Expiration should be long and controlled (using, for example, pursed lips breathing) and automatic inspiration. This last point is particularly important. In dyspnoea, expiration and inspiration are equal. A person has the desire to breathe in fully but is unable to do so comfortably because he or she has not expired sufficiently. The more the patient breathes out the more the contraction of the internal intercostals causes a joint stretching of the external intercostals giving them a greater impetus for force when their turn comes during inspiration, the external intercostals expand the chest cavity and create a greater negative pressure for air to enter. Patients in breathing distress also have little pause between

inspiration and expiration and this can be rectified through techniques such as ajapa japa.

Kunjla seems to be a way of controlling autonomic tone but you have to be practised in using it, which really means staying relaxed. It seems to ease breathing during an attack though, again, I am unaware of experimental data confirming this. Kunjala is definitely beneficial in the evacuation of sputum. Why this should be so is not clear. Certainly the rhythmic contractions of the stomach help dislodge and remove any excess there. Possibly the consequent pressure changes have the same effect in the bronchial tree where excess mucus is produced by goblet cells as part of the hypersensitivity reaction in asthma. Coughing aggravates bronchospasm. So to assist expectoration 'huffing', a short, sharp exhalation with an open throat, is utilized. Inverted asanas assist drainage of secretions by gravitational force.

Holding the thorax on either side, and shaking during expiration and 'clapping' on the back are other physiotherapy techniques for dislodging mucus. They are particularly beneficial in conditions such as bronchiectasis and cystic fibrosis where copious amounts of purulent sputum may be released from the lung bases. Research appears inconclusive on the effectiveness of these techniques, though 'huffing' and postural drainage position, i.e., inverted yoga postures, are the most validated procedures. Let me illustrate some of these principles in the situation of an acute asthmatic attack.

First, the patient must be reassured. You have somehow to convey the brain waves that you want them to pick up. Calm induces calm. Second, they should be positioned advantageously – sitting up with the spine straight and at right angles to the legs, or, if breathing is still difficult, sitting on a chair and leaning forward resting the head on the forearms supported by a pile of pillows on a table. This posture facilitates apical breathing without the necessity for muscular effort. It also makes it easier for them to feel respiratory movement in the belly.

Third, a hand on their shoulders helps to lower them. Similarly, a hand on the abdomen assists in guiding the breath to that area. Fourth, it normally takes 20 minutes for an aerosol bronchodilator to reach full effect and during this time after administration a brief yoga nidra may be administered in the sitting position.

Fifth, once a level of bronchodilation has been achieved, warm drinks will help with expectoration by loosening up mucus. At this stage also the chest may be auscultated to reveal the major areas of secretions (greatest areas of crackles and crepetations) and, after reassurance, the patient positioned in a postural drainage position and is asked to 'huff'.

Sixth, the patient should be left relaxed i.e., with a short yoga nidra. Patients who are familiar with kunjai or who have a personal method of overcoming the difficulty, i.e., taking hot black coffee, should be encouraged to do so under supervision. Of course, if any of the classical danger signs of status asthmaticus appear (cyanosis, silent chest, significant pulsus paradoxus, extreme distress), urgent medical attention, i.e., appropriately administered steroids and oxygen therapy, is required.

Science, Yoga & Disease

The psychic and mental diseases which human beings are suffering from are nothing but a state of disharmony in the energy system. In order to alleviate them we will have to take a new look at our body and enlarge the dimension of modern medical science. We will have to re-define the body, the classification of disease and the system of diagnosis.

Physical and mental therapy is one of the most important achievements of hatha yoga. So far, it has succeeded in diseases like asthma, diabetes and high blood pressure where modern science has not. Besides this, hatha yoga has proved very effective in cases of epilepsy, hysteria, rheumatism and many other ailments of a chronic and constitutional nature. Most diseases of a chronic and constitutional nature can definitely be reversed through hatha yoga.

—Swami Satyananda Saraswati

YRF News

A Yoga Research Foundation Yoga Asthma Study camp was held from 1st to 29th April at Dallirajhara, MP. This camp was organized by the Yoga Mitra Mandal, Dallirajhara and the Bhilai Steel Plant. Mr M. Sethi, along with Dr G.R. Namdev MD, attended and assisted in Yoga Asthma Study courses in Munger and Raipur in preparation for organizing the Dallirajhara Camp. The Bhilai Steel Plant contributed the use of hospital facilities and doctors for testing and examination procedures. There were 34 applications for this well organized study course and 24 people fitted the criteria for the study.

The YRF team then travelled to the city of Raipur, for their first Follow-Up Camp from 21st to 28th April, organized by Swami Asheshananda Saraswati of Satyadarshan Yogavidyalaya, Raipur. The YRF Team from Munger included Swamis Omkarananda, Sambuddhananda, Jyotirupa and Atmadhara Saraswati.

A Yoga Asthma Study Course was conducted from 11th to 30th May using the new and revised procedures discussed at the 2nd Doctors' Symposium in January this year. Fourteen people applied for the asthma course and five were accepted into the Study.

The Yoga Research Foundation was established in 1984 by Swami Satyananda Saraswati to investigate the ancient principles of yoga in the framework of scientific knowledge and make its holistic and time-tested methods accessible to a wider range of society.

Instructions to authors

Articles should be sent to YRF in duplicate. Manuscript should be typed in English, double spaced, on one side of the sheet and numbered consecutively. The title page should clearly give: the names of all authors, place of research, a concise title, list of tables and figures. An abstract of not more than 200 words should precede the article. Tables and figures should be constructed with due consideration of paper size and hand-press procedures. References should be carefully checked, numbered consecutively and presented in accordance with this magazine format. Once articles are received the material or proofs cannot be returned to the author.

The journal is devoted to research into the scientific, health promotive and disease preventative aspects of yoga. At present the selected papers relate mostly to a five-year study of yoga in relation to bronchial asthma which is being conducted simultaneously in India and Australia. Research reviews, theoretical and methodological articles, letters, comments and abstracts which are related to this field will also be published.

Printing of articles is at the discretion of the YRF, however the articles contained are individual works and do not necessarily reflect the views of YRF.

The *Journal of the Yoga Research Foundation* is published every six months in June and December, the subscription rates are: Rs. 30/- i.e. Rs 15/- per issue and Rs. 5/- for postage; for overseas US \$10/- sent as registered post.

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Yoga does not go by beliefs; it goes by investigations and discoveries. I want to develop the scientific side of yoga with the help of open-minded examiners and investigators because yoga science has much to contribute to the good of humanity.

I am absolutely sure about it. It is science, scientists, and scientific thinking which will preside over the destiny of humankind, and this science will recognize the potential of yoga for humanity.

—Swami Satyananda Saraswati

Yoga Research Foundation (YRF) launches its publications with the reproduction of four original journals published in 1989–1990. Mainly dedicated to the YRF five-year study on asthma, this volume reflects the interest and enthusiasm of medical doctors and yoga teachers in opening yoga to scientific investigation. Contributors from around the world have participated in this venture and shared their knowledge.



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